A revision of the species of Sertulariidae (Coelenterata: Hydroida) recorded from Britain and nearby seas

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Contents

†, ††, †††, ? conspecific pairs.

Synopsis

The nominal species of hydroids belonging to the family Sertulariidae recorded from Britain and neighbouring seas are revised. Twenty-four valid species are provisionally recognized.

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Introduction

This report is one of a series produced to meet the current need for taxonomic revision of the western European hydroids (Cornelius, 1975*b*; Cornelius, in prep.) and contains a revision of the nominal species of the family Sertulariidae *sensu* Millard (1975). It is the first revision of British Sertulariidae since that of Hincks (1868), based largely on the works of Johnston (1838, 1847), so a new revision is long overdue.

The faunal area corresponds approximately with the local Continental Shelf (Cornelius, 1975*b*: Fig. 1). It comprises British waters westwards and northwards to the 183 m (600 ft) depth contour, the North Sea (excluding the cold trough off W & SE Norway), Oslo Fjord, Danish waters, the Swedish west coast, the coasts of Germany, the Netherlands and Belgium and the whole of the English Channel, south to the latitude of the Isle d'Oeussant (Ushant, 48° 28′ N). Most species treated are widespread in the North Atlantic. Some are limital within the area, but only *Diphasia delagei* seems to be restricted to it. None of the species considered has a medusa stage – indeed they are unknown in this family. *Dynamena pumila* is said to have 'eumedusoids' which, although released (Teissier, 1923), probably do not represent medusae.

The number of species of Sertulariidae recognized in this paper – 24 – happens to be the same as that recorded solely from British waters by Hincks (1868). There are, however, two additional species, *Diphasia delagei* and *Sertularia tenera* (although neither has been reliably recorded from Britain), while Hincks' *Sertularia argentea* and *S. fusca* are here reduced to synonyms of other species. Although Hincks' account of this family seems to be largely acceptable it needs revision in places in the light of much subsequent work, some of it contradictory. For example, there is scope for new species concepts in the genera *Salacia*, *Sertularella* and *Sertularia*.

Although it may seem that some taxonomic stability has at last been reached, the conclusions drawn must be regarded with some caution as they are based on the fauna of an arbitrary, restricted area. Indeed, none of the genera recognized is restricted to the Atlantic Ocean so the genera involved need to be revised on a world-wide basis. Similarly, many species are widely distributed; there being a high proportion of near-cosmopolitan and 'bi-polar' species in this as in many other groups of hydroids. Undoubtedly much of the taxonomic confusion in the past stems from attempts to prepare faunal accounts of restricted areas. I have attempted to show elsewhere (Cornelius, 1975*a*) the number of invalid species described in the genus *Obelia*, in which it seems that over 100 previously accepted species can be reduced to 3 nearly cosmopolitan species and perhaps 2 or 3 others. In British waters, Hincks (1868) referred 6 species to *Obelia;* but of these only 2 are now admitted. (The third cosmopolitan species of *Obelia* was unknown in European waters until the twentieth century.) It seems likely, therefore, that the present revision will be modified when each of the species recognized herein can also be evaluated as part of the world fauna.

On the other hand, a detailed study solely of the European hydroid fauna is defensible on the grounds that it will hopefully provide some basis for taxonomic revisions of non-European faunae. Indeed, the type species of many widely distributed hydroid genera were described first from Europe. First studied by the pre-Linnaean European botanists, their study received considerable impetus from the books of John Ellis (Ellis, 1755; Ellis & Solander, 1786); and Linnaeus (1758) based many of his hydroid species on those recognized in the earlier of Ellis' books. The subsequent works of Pallas (1766) and Linnaeus (1767) consolidated Europe's lead in hydroid systematics at that time. Many of the species described by those early workers – in general the large, conspicuous species – have subsequently proved to be very widely distributed throughout the world. It seems certain, therefore, that a European study will also contribute substantially to the stability of nomenclature throughout the group. Since in general the large, conspicuous species are those in which nomenclative problems are most acute, perhaps because they have been more widely collected than smaller species, the contribution to stability is important not only in providing ground work for a world-wide nomenclative stability but in addition in fulfilling a need for a widely accepted check-list of names of use to non-specialists. Nevertheless some name changes are inevitably introduced in the present paper, particularly in species of the genera *Diphasia* and *Sertularella*. Finally, there is the need to provide re-descriptions for identification purposes.

In the following revision the genera are arranged alphabetically, and within each genus also the species are treated in alphabetical sequence. To facilitate comparison between species the illustrations appear in a slightly different sequence from the descriptions. The morphological characters used in the present revision are discussed at length in the next section.

A problematical distribution record is dealt with towards the end of the account (p. 306) and 5 species unreliably recorded from the area are removed from the faunal list (p. 306). None of these was listed by Hincks, only one (*Sertularia evansi*) having been recorded before his work appeared. For convenience the generic diagnoses provided by Millard (1975) are followed where possible. Nomenclature of the genus *Tamarisca* is discussed here under the nominate species, *T. tamarisca*; but for the most part discussion of generic synonymies is avoided since generic limits in the family are widely regarded as arbitrary. It would seem desirable to consider all species of the family before redefining the genera and this is not attempted here.

The material examined was drawn mainly from the collections of the British Museum (Natural History) and carries registered numbers of the format 1865.3.4.2. The numbers reflect the approximate dates, in reverse, on which the specimens were first registered and not the dates of collection or of deposition in the Museum. Specimens loaned by other Museums are so indicated.

Scientific names of algae mentioned follow those in the check-list of Parke & Dixon (1968), and those of marine invertebrates other than coelenterates follow Marine Biological Association (1957) unless otherwise stated.

Morphological and other variation

(Variation is discussed also under each species.)

Colonial hydroids exhibit within a colony a range of morphological variation of the kind more usually associated with whole populations of solitary organisms. That there is any variation at all between members of a single colony is perhaps remarkable, and it is difficult to determine which of it is genotypic and which is phenotypic. Indeed, since the normal developmental processes of thecate hydroids are only now becoming understood (for example by Knight, 1965, and Beloussov, 1973) it seems as yet unwise to attempt to distinguish between the two types. The same difficulties apply also when between-colony comparisons are made, and the biggest current problem in hydroid taxonomy is to tell one kind of variation from the other. Although a few morphological characters are now believed from observation to vary in response to environmental factors the influence of these on the majority of characters is virtually unknown (see below; and Cornelius, 1975*a*, for remarks on environment-induced variation in the hydroid stage of *Obelia*). Nevertheless, there seems to be some value in comparing trends in intraspecific variation throughout the 24 species treated here. Hopefully, in due course, it will become possible for variation in the taxonomic characters used to be assessed and guidelines suggested for evaluating variation in these and other nominal taxa.

Environment-induced variation

(*a*) *In* Dynamena pumila. Lower shore specimens of this largely intertidal species are said to be more branched than those from higher shore levels (Broch, 1918). Preliminary observations (p. 271, below) suggest that low-level colonies are larger and more advanced reproductively at any one time than colonies at higher levels, perhaps reflecting differences in feeding opportunities. Colonies on sheltered shores appear to have thinner perisarc, and larger and proportionately longer hydrothecae, than those on more exposed shores.

(*b*) *Internode length.* Broch (1918) considered this to increase with depth in some species but a relation has not been proved conclusively. Probably other factors, either or both phenotypic and genotypic, also influence internodal length and for the present little taxonomic value can be placed on it.

(*c*) *Sterility.* The occasional intertidal specimens of *Sertularella polyzonias* that occur are thought to remain infertile (p. 289), perhaps in response to reduced feeding opportunity.

Variation of unknown cause

(*a*) *Dimensions.* The tables of measurements in the following account show that all dimensions of skeletal structures, particularly those of the hydrotheca, vary in length and only exceptionally does it seem justifiable to regard size as a taxonomic criterion. One such instance might be the distinction between the two *Abietinaria* species treated here (p. 254), but this is not certain. For the present it seems unwise to accept nominal taxa – whether specific or varietal – based on size differences alone, even when the differences seem striking.

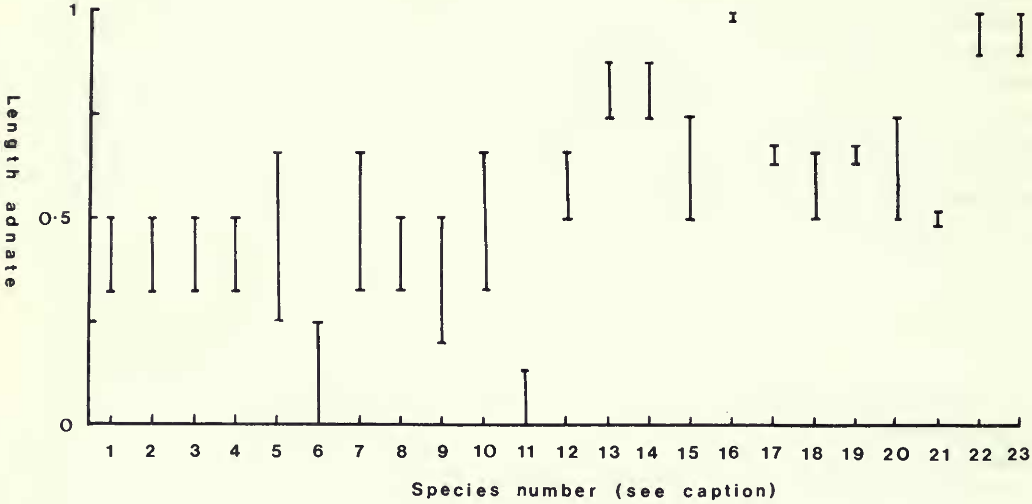


Fig. 1 Adnate portion of hydrothecal wall in species treated in the present paper (excepting *Sertularia tenera*). 1, *Symplectoscyphus tricuspidatus;* 2, *Sertularella gaudichaudi;* 3, *S. gayi;* 4, *S. polyzonias;* 5, *S. rugosa;* 6, *S. tenella;* 7, *Sertularia cupressina;* 8, *S. distans;* 9, *Abietinaria abietina;* 10, *A. filicula;* 11, *Hydrallmania falcata;* 12, *Diphasia attenuata;* 13, *D. delagei;* 14, *D. fallax;* 15, *D. margareta;* 16, *D. nigra;* 17, *D. pinastrum;* 18, *D. rosacea;* 19, *Dynamena pumila;* 20, *Amphisbetia operculata;* 21, *Tamarisca tamarisca;* 22, *Salacia articulata;* 23, *S. thuja.*

(*b*) *Hydrothecal characters.*
(i) Portion adnate. An evolutionary progression occurs in the thecate families from pedicellate hydrothecae through the adnate condition to a total inclusion of the hydrotheca within the hydrocaulus (Naumov, 1960, 1969); and although the precise evolutionary details have not been determined a similar progression also seems to occur in the present family. However, in some species the adnate proportion of the hydrothecal wall varies considerably (Fig. 1) and while there is on the one hand an overall systematic interest in the progressive incorporation of the hydrotheca into the hydrocaulus, on the other the precise degree of incorporation cannot be regarded a useful specific criterion.
(ii) Outward flexure of hydrotheca. Some species of Sertulariidae have hydrothecae which are out-turned, usually approximately midway between diaphragm and aperture. In many species the angle of outward flexure is variable, sometimes within a colony, while in others it seems more constant. In some there is a gradual curve, in others an abrupt bend with what appears to be a crease in the hydrothecal perisarc. Although in many genera (e.g. *Sertularia*) the angle of flexure is variable and probably of little taxonomic use, in others (e.g. *Diphasia*) it does seem useful in delimiting taxa.

In the genus *Sertularella* the narrow, distal third of the hydrotheca turns inward or outward from the hydrothecal axis or is straight. Variation in this has been used as a specific criterion in several publications by Millard (summary in Millard, 1975) but seems variable at least in the species here called *S. gaudichaudi* (p. 283) and should probably be used cautiously.

(iii) Number of cusps on hydrothecal rim. Although variable in some species (e.g. *Amphisbetia operculata*) the number of cusps, and to a greater extent their presence or absence, provide good taxonomic criteria at species level in the present faunal group. In addition, distinction between the genera *Symplectoscyphus* and *Sertularella* continues to be made on the basis of the number of cusps (three and four respectively). Although arbitrary, this distinction provides a working classification which can be used until more widely based generic limits can be worked out (Ralph, 1961).

(iv) Internal cusps in hydrothecae of *Sertularella* species. See page 283.

(v) External ornamentation. Regular patterning is rather unusual in hydroids. However, fine transverse ridging seems to be a diagnostic character of *Diphasia delagei* in which it occurs on both hydrotheca and gonotheca; but the occurrence of similar ridges on the hydrothecae of a single specimen of *Tamarisca tamarisca* (Fig. 29), a species in a closely related genus, gives grounds for caution. Similar ridging has been recorded as diagnostic of several species occurring outside the present faunal area (p. 260).

In the genera *Sertularella* and *Symplectoscyphus* a different and very much coarser ridging or corrugation is widespread. Although ridge number and size have been widely used as specific characters in these and other genera it is suggested below that they vary intraspecifically to such an extent that they do not always provide good taxonomic criteria (p. 293).

(vi) length : breadth ratio of hydrothecae. Although this seems approximately constant within a colony comparison of the ratio between colonies suggests that it is certainly not constant throughout the geographical range of most species treated here (see measurement tables for each species). At least in *Dynamena pumila* it seems to vary in response to environmental factors (p. 271), and hydrotheca length : breadth ratio does not seem a reliable specific character.

(vii) Arrangement of hydrothecae and hydrocladia. The species described here can be arranged in a series proceeding from those in which the hydrothecae are alternate (possibly the primitive condition) to those in which they are opposite. Stages in the series are here termed alternate, sub-alternate, sub-opposite and opposite for convenience of description, but the series is of course continuous. Although there is some intraspecific variation, position in the series seems to provide useful generic and sometimes specific characters.

All species in the present faunal group have a biseriate arrangement of the hydrothecae (with the exceptions of occasional triseriate specimens of *Diphasia fallax* and *Salacia thuja* and the secondary, pseudo-monoseriate arrangement in *Hydrallmania falcata*). Several arctic species are characteristically polyseriate (Naumov, 1960, 1969) but none has been recorded from the present area.

Two species, *Hydrallmania falcata* and *Amphisbetia operculata*, undergo a cataclysmic change in arrangement of the hydrothecae early in colony development. In *Sertularia cupressina* and *Salacia thuja* there is a similar cataclysmic change, in the arrangement of the hydrocladia. Possibly a comparable change occurs in *Sertularia tenera* also. In all 5 species the nature of these changes might give some phylogenetic clues; particularly in the case of *H. falcata* in which young colonies and occasional aberrant hydrocladia recall some of the characters of *Abietinaria* species (but see p. 274).

(*c*) *Hydranth characters*. The hydranths of many of the Sertulariidae species included here have not yet been adequately described. Accordingly, little systematic weight is at present attached to hydranth characters although further descriptive work might prove them useful. One feature which has been widely used as a generic (and even specific) criterion, however, is the offshoot of the enteron, or caecum, evident in contracted hydranths. It is perhaps significant that hydranths of preserved material are usually contracted if not relaxed before fixation. The taxonomic value of the presence or absence of caeca has been discussed recently by Mammen (1965) and Millard (1975) (see p. 279, below) and has been used as a generic character by the latter author and also by Naumov (1960, 1969). Probably it has little or only limited value as a *specific* character and, for example, its use as such in the genus *Salacia* is criticized below (p. 279). However, as discussed by Millard (1975), it seems often useful at genus level.

(*d*) *Gonothecal characters*. In all genera treated here, except *Sertularella*, gonothecal characters seem to provide reliable specific criteria, and a better understanding of that problematical genus might show them to be reliable there too. Male and female gonothecae are similar in some species of Sertulariidae, dissimilar in others. This usually varies from genus to genus (as at present diagnosed) but one species usually assigned to *Diphasia* seems exceptional in this respect (*D. pinastrum*, p. 267, being reported as having male and female gonothecae identical while in other *Diphasia* species included here they are dissimilar).

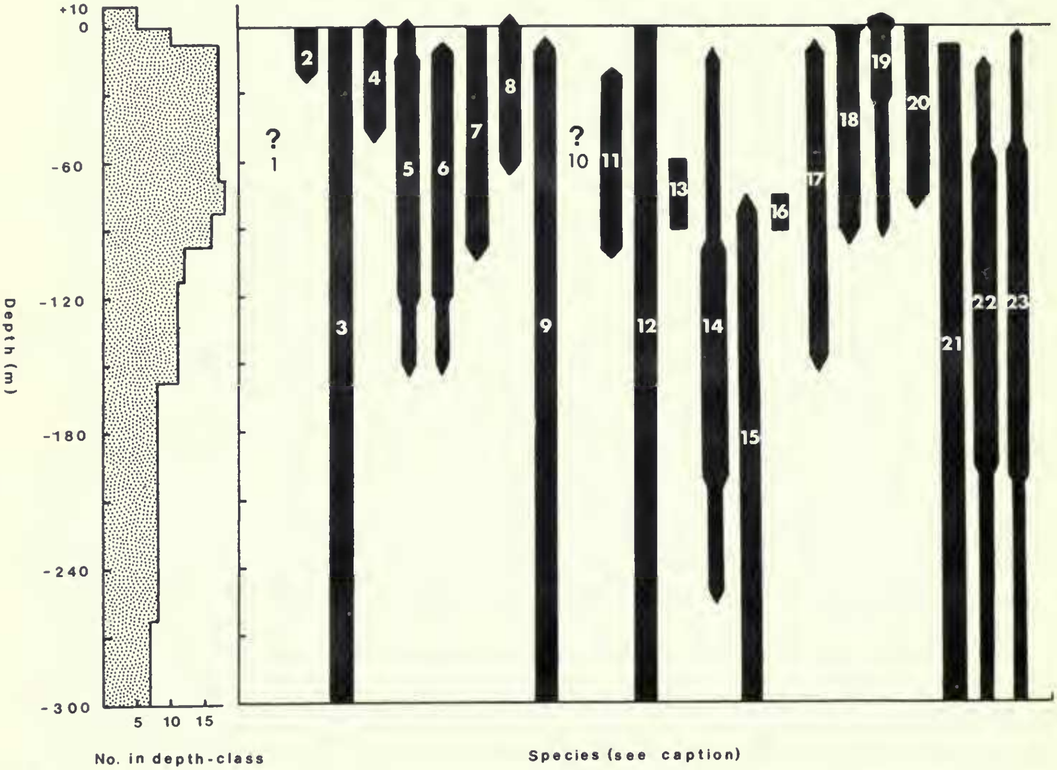


Fig. 2 Known depth ranges of Sertulariidae species occurring in Britain and nearby seas, based on data from various sources summarized in this paper. Almost certainly depth ranges in many species are incompletely known; and in 2 species (nos 1 and 10 in the figure) there is no data. Labels 1–23 as Fig. 1. Zero depth = ELWMST.

(*e*) *Habitat*. Not a useful specific criterion. Although exhaustive data is lacking no species in the present faunal group seems substrate-specific, most species occurring on a variety of substrates. Possibly there is only a generalized substrate selection by planulae in this family, but information on this point seems inadequate. Some species are characteristic of sandy bottoms, others of substrates of rock, shells, algae or other hydroids, but it seems that no species of the present faunal group enters a regular association.

Although colonies of several species can occasionally be found on the shore only *Dynamena pumila* occurs far from the low-water mark and alone can be considered partly intertidal. (See also habitat-induced variation, p. 245.) The depth ranges of many species treated here are rather wide (Fig. 2).

(*f*) *Reproductive season.* Most of the species included here have a rather long reproductive season (Fig. 3). Some are fertile in the cooler months and others in the summer, but apparently none is fertile in the autumn. Most breed later in the north than in the south, particularly *Sertularia cupressina*. Possibly the two rather similar *Abietinaria* species have different reproductive seasons but information is scant (p. 254). On the whole there seems little taxonomic value in this character.

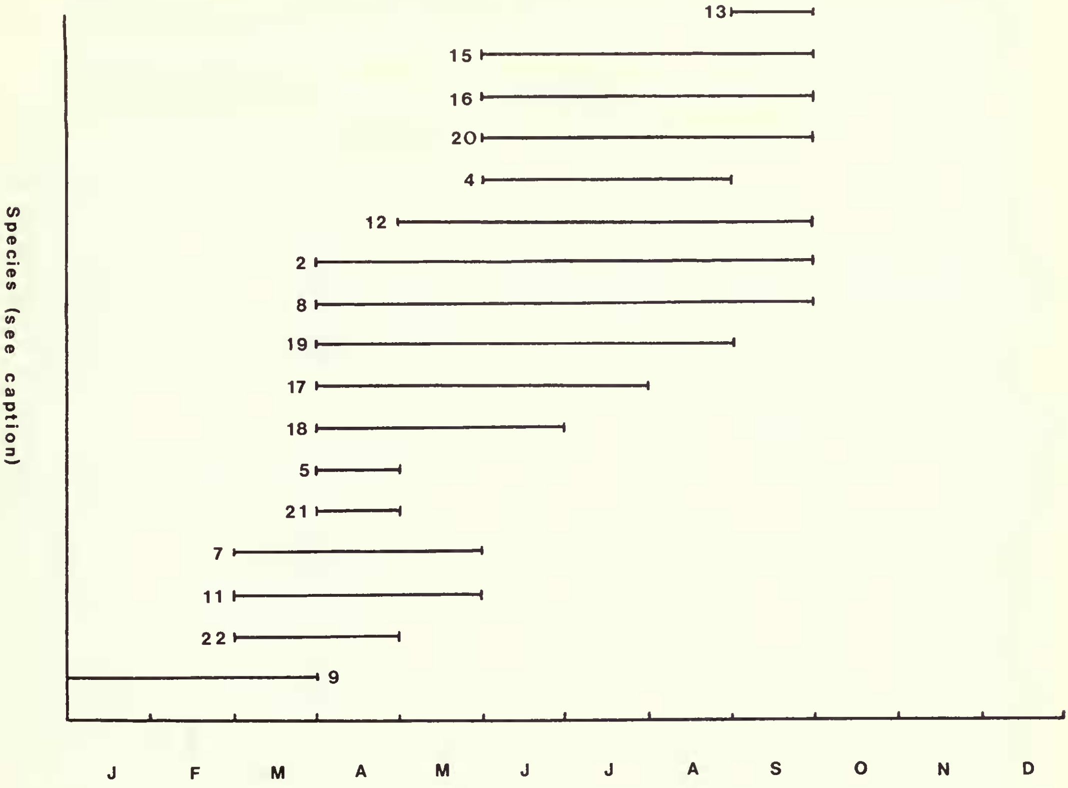


Fig. 3 Reproductive seasons of Sertulariidae species in the western English Channel, based largely on data presented by Marine Biological Association (1957) and Teissier (1965). Labels as for Fig. 1. See the entry 'Reproductive season' under each species for further data. Almost certainly the reproductive seasons of some species are incompletely known.

The scope of the genus *Sertularia*

The genus *Sertularia* Linnaeus, 1758, was formerly wider in scope, originally including species now assigned to families regarded distant as well as having once been applied to some bryozoan species. In addition most species in the present account have been referred to *Sertularia* at one time or another. There seemed little value in presenting a survey of past use of this generic name, and exhaustive accounts are already available in the synoptic lists of Bedot (1901, 1905, 1910, 1912, 1916, 1918, 1925: Hydrozoa) and Jelly (1889: Bryozoa). Early British usages of *Sertularia* were summarized by Johnston (1847: Bryozoa & Hydrozoa) and Hincks (1868: Hydrozoa). In addition, the index entries under *Sertularia* (p. 317) will serve as a guide to usages in the species treated here. Local uses in other hydroid families will be similarly covered in other papers (e.g. Cornelius, 1975*b*; Cornelius, in prep.). Pennington (1885) was probably the last synoptic author to employ the name *Sertularia* for bryozoan species.

Key to species

Only species which have been reliably recorded have been included (see pp. 306–308 for rejected and unreliable records). Provisional identifications can often be made from gonothecae by reference to the illustrations. Gonothecal characters are not included in the key, however, as many specimens lack them.

1 Rims of hydrothecae even; notched in some species but never cusped 2
– Rims of hydrothecae cusped; not notched 11

2 Hydrothecae totally contained within perisarc or nearly so (*Salacia;* see also ***Diphasia nigra***, p. 265) 3
– Terminal quarter or more of hydrothecae projecting from perisarc 4

3 Branches in one plane . . . . . ***Salacia articulata*** (p. 276; Fig. 17)
– Branches all round stem (except in young colonies) . . . . . ***Salacia thuja*** (p. 280; Fig. 19)

4 Hydrothecae apparently on one side of stem only . . . . . ***Hydrallmania falcata*** (p. 273; Fig. 15)
– Hydrothecae biseriate (rarely triseriate, in *Diphasia fallax* & *Salacia thuja*) 5

5 Hydrothecal surfaces with fine transverse ridges . . . . . ***Diphasia delagei*** (p. 259; Fig. 10)
[Also occasional specimens of *Tamarisca tamarisca* (p. 304; Fig. 29)]
– Hydrothecal surfaces not finely ridged 6

6 Axillary hydrothecae present and clearly associated with axils. (For distinctions see text, p. 253) . . . . . ***Abietinaria abietina*** and ***Abietinaria filicula***
– Axillary hydrothecae absent 7

7 Side branches narrower than main stem; colony regularly pinnate 8
– Side branches same width as main stem; colony irregularly pinnate, or not pinnate at all 10

8 Adjacent walls of hydrothecae (almost) entirely adnate . . . . . ***Diphasia nigra*** (p. 265; Fig. 12)
– Adjacent walls of hydrothecae at most three quarters adnate 9

9 Hydrothecal flexure *c.* 45°; sides of main stems approximately parallel ***Diphasia pinastrum*** (p. 267; Fig. 13)
– Hydrothecal flexure *c.* 90°; sides of main stems constricted below each hydrotheca ***Diphasia margareta*** (p. 263; Fig. 11)

10 Hydrothecae half adnate; flexure abrupt, *c.* 45°. (For distinctions see text, pp. 257–259) ***Diphasia attenuata*** and ***Diphasia rosacea***
– Hydrothecae two thirds or more adnate; flexure gradual, less than 45° ***Diphasia fallax*** (p. 260; Fig. 9)

11 Number of cusps on hydrothecal rims two or three (one may be minute) 12
– Number of cusps on hydrothecal rim four (*Sertularella*) 18

12 Two hydrothecal cusps 13
– Three hydrothecal cusps 17

13 Hydrothecae in (sub)opposite pairs 14
– Hydrothecae alternate 16

14 Hydrothecal cusps markedly unequal . . . . . ***Amphisbetia operculata*** (p. 254; Fig. 6)
– Hydrothecal cusps approximately equal 15

15 Nodal constrictions of one kind, all transverse . . . . . ***Dynamena pumila*** (p. 271; Fig. 14)
– Nodal constrictions of two kinds, transverse and oblique . ***Sertularia distans*** (p. 296; Fig. 26)

16 One (rarely both) of the cusps on hydrothecal rims long (see p. 301 for distinctions; see also young *Amphisbetia operculata*, p. 254) . . . . . ***Sertularia cupressina*** and ***Sertularia tenera***
– Both cusps on hydrothecal rims short (young colonies, or aberrant branches on mature colonies) . . . . . ***Hydrallmania falcata*** (p. 273; Fig. 15b)

17 Hydrothecae approximately straight; length : breadth ratio *c.* 2 : 1 ***Symplectoscyphus tricuspidatus*** (p. 301; Fig. 28)
– Hydrothecae curving outwards; length : breadth ratio *c.* 4 : 1 ***Tamarisca tamarisca*** (p. 304; Fig. 29)

18 Length : breadth ratio of hydrothecae less than 2 : 1 (for distinctions see p. 293) ***Sertularella rugosa*** and ***Sertularella tenella***
– Length : breadth ratio of hydrothecae 2 : 1 or more 19

19 Three (rarely one, two or four) sub-distal cusps on inside of hydrothecal wall; internodal perisarc and hydrothecal wall usually smooth . *Sertularella gaudichaudi* (p. 282; Fig. 20)

– No cusps on inside of hydrothecal wall; internodal perisarc and hydrothecal wall usually undulating to rugose (for distinctions see text, p. 287) *Sertularella gayi* and *Sertularella polyzonias*

Systematic descriptions

Abietinaria abietina (Linnaeus, 1758)

(Fig. 4)

Corallina marina abietis forma . . . Ellis, 1755 : 4–5, pl. 1, figs B, b.

Sertularia abietina Linnaeus, 1758 : 808; Ellis & Solander, 1786 : 36–37; Hincks, 1868 : 266–268, pl. 55 (syn. *S. abietinula* Dalyell, 1847).

Abietinaria abietina: Broch, 1918 : 117–118; Kramp, 1935 : 184–185, fig. 77 A–B; Fraser, 1944 : 238–239, pl. 50, fig. 233; Vervoort, 1946 : 237–240, figs 103–105; Leloup, 1952 : 182–183, fig. 106; Naumov, 1960 : 375–376, fig. 264; Rees & Thursfield, 1965 : 139; Naumov, 1969 : 404–405, fig. 264; Calder, 1970 : 1525, pl. 5, fig. 6; Vervoort, 1972 : 98.

TYPE LOCALITY AND MATERIAL. Linnaeus (1758) gave the type locality as 'in Oceano'. The one sheet of herbarium material in the Linnaeus collection of the Linnean Society of London (catalogued 1298.4 by Savage, 1945) does not agree with the original diagnosis, and cannot be regarded as part of the original type series. The sheet bears a much branched infertile colony which incidentally does not resemble Ellis' (1755) illustration, which Linnaeus cited. Linnaeus' diagnosis mentioned gonothecae, which are absent from the specimen but present on Ellis' plate. Thus it seems that, as with many thecate hydroids, Linnaeus based his diagnosis on Ellis' illustration, and the illustrated specimen can be regarded as the holotype. Some Ellis material was preserved in the Museum of the Royal College of Surgeons of England until 1944 when much of the collections, including virtually all the hydroid material, was destroyed. It thus appears that the holotype specimen is no longer extant, although the original drawing of it survives (see Cornelius, 1975*a* : 267, footnote). Ellis did not give a locality for this species, but later collected it from Brighton (Ellis & Solander, 1786). The type locality of this species is accordingly here restricted to the south coast of England.

MATERIAL EXAMINED. This common and distinctive species is well represented in the BM(NH) collections and only specimens referred to in the text or illustrated are listed here. Isle of Man, ? 4 Sep 1894 (see notes under Reproductive season), fragments of ♀ colony on two microslides, coll. E. T. Browne, 1961.11.4.52–53 (Fig. 4b; Table 1). Lowestoft, Suffolk, part of colony on microslide, coll. G. J. Hinde, 1920.2.26.4 (Table 1). Off Wexford, Eire, 26 May 1901, 80 m ('Helga' sta. 54), hydrocladia on microslide, via E. T. Browne coll. 1967.6.15.21 (Fig. 4a).

DESCRIPTION. [Closely resembles *A. filicula* but is larger and more robust in appearance (see p. 253).] Colony erect, pinnate, monosiphonic, sturdy, up to 350 mm (Vervoort, 1946; Naumov, 1969) but often 50 mm or less; stolon tortuous. Hydrocaulus slightly flexuose, thicker and more robust than hydrocladia, which are straight; hydrocladia alternate, some second order branching; two rows of sub-alternate to alternate hydrothecae on both hydrocaulus and hydrocladia; axillary hydrothecae present. Hydrothecae variable, flask-shaped, bulbous proximally, tapering towards distal aperture; $\frac{1}{5}$–$\frac{1}{2}$ adnate; aperture circular, even, operculum attached on adjacent side, often deciduous; inner wall usually notched below aperture. Hydranth with diverticulum on outer side, *c.* 25 tentacles. Gonotheca ♂ = ♀, attached below hydrotheca, elongate-ovoid, walls thin, smooth to sinuous, tapering basally, ending distally in raised, circular aperture with *c.* 10 internal downward-pointing cusps (? desmocytes). Ova retained in acrocyst, embryos said (Hincks, 1868) to be bright yellow.

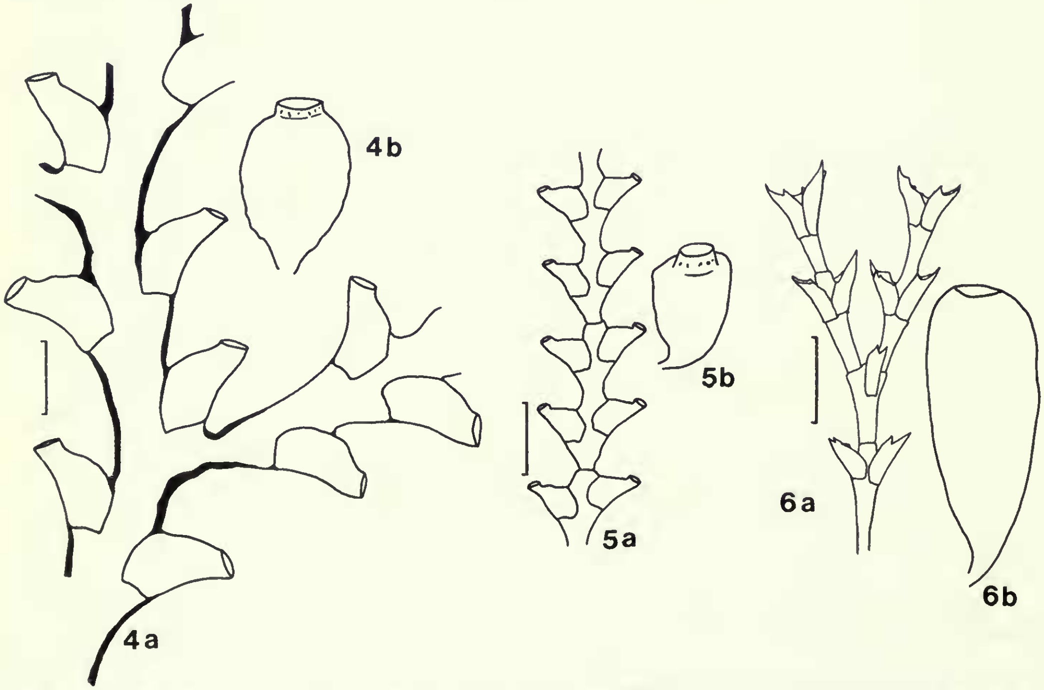
Measurements. See Table 1.

Table 1 *Abietinaria abietina.* Measurements in μm

	Holland (Vervoort, 1946)	? U.S.S.R. (Naumov, 1969)	Isle of Man (1961.11.4.53)	SE England (1920.2.26.4)
Hydrotheca				
Outer side		600–1000	650–700	520–600
Inner side, length adnate			350–420	400–430
Inner side, length free			400–450	300–320
Diameter of aperture		190–300	230–270	180–220
Gonotheca				
Length	1300	1300 (max)	1200–1300	
Diameter	850	500–850	650–820	
Length/diameter	*1·53*	*1·53–2·6*	*1·58–1·84*	

Reproductive season. Fertile material recorded January to March at Roscoff (Teissier, 1965), during 'winter and spring' in British Isles (Ellis & Solander, 1786; Hincks, 1868, Hamond, 1957). A record of a fertile specimen reported from the Scilly Isles in July (Robins, 1969 : 333) seems exceptional. Two microslide preparations made by E. T. Browne from fertile material from the Isle of Man (1961.11.4.52–53) are dated 4 September 1894, but this date may simply be that on which the preparation was made, as Browne frequently noted this on the labels.

Distribution. Common throughout the area on suitable substrates, occurring in the Kattegat but apparently not in the Baltic (Stechow, 1927; Broch, 1928; Kramp, 1935). The world distribution has been given by Broch (1918) and Naumov (1969).



Figs 4–6. **Fig. 4** *Abietinaria abietina.* (a) hydrocladia, SE Eire (1967.6.15.21); (b) gonotheca, sexed ♀ on contents (1961.11.4.53); scale (a–b) = 500 μm. **Fig. 5** *A. filicula.* (a) hydrocladium, NE England (1956.2.2.2); (b) gonotheca, Norway, 1962.11.7.15; scale (a–b) = 500 μm. **Fig. 6** *Amphisbetia operculata.* (a) Hydrocladia and (b) gontheca, SW England (1961.11.4.56); scale (a–b) = 500 μm.

HABITAT. Offshore, *c.* 10 m depth to edge of Continental Shelf. Common on sandy bottoms where it grows attached to pebbles, shells and similar objects. The species is washed ashore in large quantities where local currents are suitable (Hincks, 1868; Vervoort, 1946; Leloup, 1952).

REMARKS. *Abietinaria abietina* is a distinctive species, and no systematic revision seems necessary.

Abietinaria filicula (Ellis & Solander, 1786)

(Fig. 5)

Sertularia filicula Ellis & Solander, 1786 : 57, pl. 6, figs C, c; Hincks, 1868 : 264–266, pl. 53, fig. 3.
Abietinaria filicula: Broch, 1918 : 119–120; Kramp, 1935 : 185, fig. 77c; Fraser, 1944 : 240, pl. 50, fig. 224; Vervoort, 1946 : 240–242, fig. 106a; Naumov, 1960 : 381–383, fig. 272; Naumov, 1969 : 411–413, fig. 272.

TYPE LOCALITY AND MATERIAL. Scarborough, Yorkshire, England. Holotype (Ellis & Solander, 1786 : pl. 6, figs C, c) probably no longer extant (see notes under *A. abietina*, p. 251).

MATERIAL EXAMINED. The BM(NH) collection includes some 40 British specimens of this species, including all the herbarium material collected by George Johnston from Berwick Bay, the Firth of Forth and Scarborough, and mentioned by Gray (1848). Only the southernmost material, two Irish specimens and the measured material are listed. Vattlestraumen, Espegrend, nr Bergen, Norway, 30–40 m, 15 Aug 1962, fertile fragments on microslide, coll. W. J. Rees, 1962.11.7.15 (Fig. 5*b*, Table 2). Nr Ballantoy (= Ballycastle), Antrim, Northern Ireland, Dec 1797, colony in herbarium envelope, coll. R. Brown,[1] 1973.10.9.35. Bertraghboy, Connemara, Eire, 1874, colony in spirit, coll. A. M. Norman, 1912.12.21.358. Clachan Bridge, Seil, Argyll, Scotland, 1 Jun 1962, several fertile colonies in spirit, coll. W. J. Rees, 1962.6.19.1. Port Erin, Isle of Man, 14 Apr 1894, coll. E. T. Browne, 1948.10.1.15. Bridlington Bay, Yorkshire, 7 Nov 1921, fragments on microslide, coll. Ministry of Agriculture, Fisheries and Food, 1956.2.2.2 (Fig. 5a, Table 2). Plymouth, Devon, 8 Mar 1895, colony in spirit, coll. E. T. Browne, 1948.9.8.101.

DESCRIPTION. [Closely resembles *A. abietina* but is smaller and more delicate in general appearance (see p. 254).] Colony erect, pinnate, up to *c.* 100 mm (Vervoort, 1946). Main stem flexuose to straight; hydrocladia equal in width to main stem, alternate, with some second order branching. Hydrothecae in two rows, sub-alternate to alternate, on both main stem and branches and in axils; flask-shaped, bulbous basally, tapering distally to a neck which is said to be more defined than in *A. abietina;* $\frac{1}{3}$–$\frac{2}{3}$ adnate; aperture circular, even, inclined towards hydrocaulus or (less often) at right angles to long axis of hydrotheca; deciduous operculum attached to inner side; notch below aperture on inner side said to be deeper than that in *A. abietina.* Hydranth apparently undescribed. Gonotheca ♂ = ♀, elongate-ovoid, said to be proportionately longer than in *A. abietina* although measurements given here suggest proportions are similar (Tables 1, 2); aperture terminal, raised, with internal cusps.

MEASUREMENTS. See Table 2.

Table 2 *Abietinaria filicula.* Measurements in μm

	? Locality (Vervoort, 1946)	U.S.S.R. (Naumov, 1969)	Norway (1962.11.7.15)	NE England (1956.2.2.2)
Hydrotheca				
Outer side		330–350	320–360	310–340
Inner side, length adnate		210–250	190–230	200–220
Inner side, length free			150–180	170–190
Diameter of aperture		100–130	70–100	90–110
Gonotheca				
Length	900	900	1000	
Diameter	600	600	540	
Length/diameter	*1·5*	*1·5*	*1·85*	

REPRODUCTIVE SEASON. Apparently no published information. Collecting dates of two fertile specimens in the BM(NH) collection, taken 1 June 1962 in Argyll and 15 August 1962 near Bergen, Norway, perhaps indicate a difference in breeding season from *A. abietina* which breeds during winter and spring. Hamond (1957) recorded infertile material from Norfolk on 23 March 1952, at which time of year *A. abietina* would probably be fertile or at least bearing empty gonothecae.

DISTRIBUTION. Said to be boreal (Broch, 1918), recorded from most of the present area though regarded by Hincks (1868) as uncommon south of Scotland. The species has been considered local in occurrence (Hincks) and, in marked contrast to the similar but larger *A. abietina*, is poorly represented in the BM(NH) collections. The recorded world ranges of the two species are similar, though said (Naumov, 1969) not to be identical.

Southerly records of *A. filicula* are few, but include the following: Guernsey (Ansted & Latham, 1862, but not recorded there by Vervoort, 1949), Plymouth (present material), Ilfracombe (Cutcliffe, in Palmer, 1946, undated record), Liverpool (Byerley, 1854), Anglesey in 1940, 1948 and 1964 (Marine Science Laboratories, University College of North Wales, Bangor, unpublished records communicated by K. Hiscock) and Whitstable (Sorby, 1908; but not mentioned by Newell, 1954). The species has been recorded more often north of a line passing through the Isle of Man and Norfolk and published records suggest that from this line northwards it can at present be found offshore locally. The species has been reported from northern parts of Ireland but not from the south (Thompson, 1856; Stephens, 1905; present material), although recent information is apparently lacking. *A. filicula* is absent from the fauna lists of Dale, Plymouth, the Scilly Isles, Roscoff and the Glenan Isles (Marine Biological Association, 1957; Teissier, 1965; Crothers, 1966; Fey, 1969; Robins, 1969). Naumov (1969) stated that the species occurs southwards to 'the latitude of central France' but did not cite material. In the southern North Sea the species was not recorded from Belgium (Leloup, 1952), but there is an undated record from Holland (Vervoort, 1946) and it is recorded from the north-west coast of Germany (Broch, 1927), from Helgoland and Denmark (Kramp, 1935). Apparently the species does not occur in the Baltic (Stechow, 1927; Broch, 1928).

Almost all the records from the south of the area are from the last century and it seems that the southern limit of this species has moved northwards during the past 100 years.

HABITAT. Apparently no published information on substrate preference. In Russian seas reported from depths of 6–540 m, but not usually below 40 m (Naumov, 1969).

REMARKS. Specific status is retained for this poorly known form, although it shows a striking similarity to *A. abietina* in all but colony habit and dimensions. The apparent difference in reproductive season between the two species is not yet sufficiently documented for use as a specific criterion.

Amphisbetia operculata (Linnaeus, 1758)

(Fig. 6)

Corallina muscosa denticulata procumbens . . . Ellis, 1755 : 8, pl. 3, figs B, b.

Sertularia operculata Linnaeus, 1758 : 808; Hincks, 1868 : 263–264, pl. 54; Teissier, 1922 : 357–361; Teissier, 1929 : 647–650, figs 5–6; Vervoort, 1946 : 249–251, fig. 109; Blanco, 1966 : 1–6, figs 1–11.

Sertularia usneoides Pallas, 1766 : 132 (nom. nov. pro *S. operculata* Linnaeus, 1758).

Amphisbetia operculata: Agassiz, 1862 : 355; Stechow, 1923 : 199–200; Ralph, 1961 : 775–779, figs 8i–k; Rees & Thursfield, 1965 : 141; Vervoort, 1972 : 98–99 (syn. *Dynamena pulchella* d'Orbigny, 1846; *S. furcata* Trask, 1857).

Dynamena operculata: Naumov, 1960 : 330–331, fig. 220; Naumov, 1969 : 357–358, fig. 220.

TYPE LOCALITY AND MATERIAL. Linnaeus (1758) gave the type locality as 'in Oceano'. The Linnaeus collection in the Linnean Society of London contains no specimens (Savage, 1945; personal observation). The species almost certainly does not occur in Swedish waters (see Distribution, below) and as with other sertularian hydroids it seems plausible that Linnaeus based the designation of this species on previously published accounts (see also note 13, p. 309). One of the accounts cited by Linnaeus was that of Ellis (1755), and it seems likely that Linnaeus worked at least partly from Ellis' illustration (pl. 3, figs B, b). The illustrated specimen can be regarded the holotype. It is almost certainly no longer in existence (Cornelius, 1975*a* : 267). Ellis gave no locality for the specimen but since his book dealt with the British fauna it seems appropriate to restrict the type locality to coastal waters of the British Isles. Agassiz (1862) suggested a restriction to 'Europe' but this seems too wide as the species does not occur in several European countries.

Material examined. This species is well represented in the BM(NH) collections and only measured or illustrated material is listed below. Redcar Bay, Yorkshire, England, part of infertile colony on microslide, coll. J. Ritchie, 1964.8.7.149 (Table 3) (mentioned, Rees & Thursfield, 1965). Off Dungeness, Kent, 50° 47½′ N, 1° 10′ E, 28 Aug 1947, 35 m, part of fertile colony on microslide, coll. m.v. 'Manihine', 1947.10.6.18 (Table 3). Wembury Bay, Plymouth, Devon, part of fertile colony on microslide, coll. E. T. Browne, 1961.11.4.56 (Figs 6a–b, Table 3) (the microslide preparation is dated 29 Nov 1897 in Browne's hand but this is probably the date on which it was made since November is outside the normal breeding season). Valencia, SW Eire, 28 Jul 1895, part of infertile colony on microslide, coll. E. T. Browne, 1961.11.4.55 (Table 3).

Description. Colony a tuft of hair-like irregularly dichotomous hydrocauli, up to *c.* 350 mm. Hydrothecae in opposite pairs (alternate in very young colonies); one pair per internode and one hydrotheca in axil of each dichotomy; tubular, ½–¾ adnate, outer side straight to slightly concave; aperture sloping inwards towards stem, rim with long outer median spine and with or without two short lateral spines, one or (rarely) both of which may also be long, variation occurring within a hydrocaulus. Hydranth with 10–12 tentacles (Vervoort, 1949). Gonotheca probably ♂ = ♀ (see Variations section, below), large, ovoid but tapering conically basally; aperture distal, wide, circular, on very short collar; 1-piece operculum, usually deciduous. 'Medusoids' released (at dawn, Teissier, 1922), producing short-lived planktonic planulae.

Measurements. See Table 3.

Table 3 *Amphisbetia operculata.* Measurements in μm

	English Channel (1947.10.6.18)	S Devon (1961.11.4.56)	NE England (1964.8.7.149)	SW Eire (1961.11.4.55)
Hydrotheca				
Length (tip of outer spine to inner corner)	370–400	300–370	300–380	350–430
Inner side, length adnate	200–230	200–210	160–170	180–230
Inner side, length free	60–70	70–100	70–90	70–90
Maximum diameter	90–110	120–130	120–140	110–130
Gonotheca (♂ = ♀)				
Length	1500	1800–2000		
Maximum diameter	800	800		
Diameter of aperture	350	280		

Variations. Hydrothecae in young colonies are often alternate (Teissier, 1929), paralleling growth changes in young colonies of *Hydrallmania falcata*, p. 273, and lack the long outer cusp characteristic of the rims of older *A. operculata* hydrothecae. Variation in the hydrothecal cusps of this species is described above (Description section). Narrower gonothecae were once thought to be male, broader ones female (Vervoort, 1949) but later evidence (Blanco, 1966) suggests that this variation is common to gonothecae of both sexes.

Reproductive season. June–September recorded from NW France (Teissier, 1965).

Distribution. Widely distributed in the Atlantic Ocean, the northern limit probably passing through northern British waters. Recorded from throughout the present area but records are most numerous from the south and west. Common in the Irish Sea and English Channel (various authors) but unrecorded from the Scilly Isles (Robins, 1969); said to be common 'round the coast of Ireland' (Stephens, 1905) and recently (1975) reported common in Co Kerry (R. J. Lincoln, pers. comm.); common off Belgium (Leloup, 1952) and found off the Netherlands (Vervoort, 1946) and East Anglia (Morely, 1943; Hamond, 1957) although probably not common over most of the southern North Sea (Vervoort, 1949). Reported from two areas in Scotland – Caithness (in 1903, Rees & Thursfield, 1965) and Shetland (Norman, 1869; several sites in 1974, the late D. N. Huxtable, pers. comm.). The Shetland records appear to be the most northerly of the species. *A. operculata* has also been either found or reported off Yorkshire (BM(NH) collection) and the Durham coast (Hogg, 1829; Norman, 1905). The species is present around the Isle of Man (Bruce *et al.*, 1963) and Anglesey (K. Hiscock, pers. comm.), and has been reported from the Clyde Sea (Rankin, 1901, but not Ritchie, 1911, or Chumley, 1918). It is apparently unrecorded from the coasts of Germany, Denmark, Norway, Sweden, the Baltic and the Faroes (Broch, 1927, 1928; Kramp, 1929, 1935; Stechow, 1927; Rees & Rowe, 1969; Christiansen, 1972) apart from the unsupported statement of Naumov (1969) that it occurs northwards to Bergen, Norway.

HABITAT. Lower shore (including rock pools; Fowell, 1944) and shallow coastal waters down to 70 m (Bruce *et al.*, 1963) and perhaps slightly deeper. Hincks (1868) noted a substrate preference for *Laminaria* holdfasts.

REMARKS. No systematic revision of this distinctive species seems necessary.

Diphasia attenuata (Hincks, 1866)

(Fig. 7)

Sertularia attenuata Hincks, 1866 : 298–299.
Diphasia attenuata: Hincks, 1868 : 247–249, pl. 49, fig. 1; Broch, 1918 : 113; Vervoort, 1946 : 236, fig. 102; Rees & Thursfield, 1965 : 119.

TYPE MATERIAL AND LOCALITY. Hincks' original description of this species was based on material from 'North Devon, Cornwall, Brighton, Yorkshire coast and Peterhead', and also on the descriptions of Ellis (1755, part) and Johnston (1847, as *Sertularia rosacea*, part, and *S. pinaster*, part, based on material from Brighton and Orkney). Of this material only a microslide once in G. Busk's collection, identified by Hincks, could be located (Whitby, Yorkshire, 1850, part of ♀ colony on microslide, coll. G. Busk, det. T. Hincks, 1899.7.1.5854). It seems likely that this specimen is that or part of that on which Hincks based the Whitby locality record in his monograph (Hincks, 1868). However, it is not clear whether Hincks had seen the specimen before making the original description, although it closely resembles that description. The appropriate status for the specimen, therefore, seems to be neotype (see also Table 4). The type locality of the species, however, can be restricted more widely than the locality of the neotype specimen, to the British Isles.

OTHER MATERIAL EXAMINED. Off Mull, Argyll, Scotland, 1 Oct 1970, spirit material and part of ♀ colony on microslide, coll. P. F. S. Cornelius, 1971.5.11.34 (Fig. 7c, Table 4). Bridlington, Yorkshire, England, 7 Nov 1921, ♀ fragments on microslide, coll. Ministry of Agriculture, Fisheries and Food, 1956.2.2.7 (Fig. 7a). SE of Old Harry Rocks, Dorset, several colonies in spirit and one microslide preparation, coll. R. Kirkpatrick, 1897.8.9.22 (Table 4). English Channel, 50° 11′ N, 1° 47′ W, 70 m ('Manihine' sta. 9), 25 Jul 1947, ♀ fragment on microslide, 1947.9.4.13. English Channel, 49° 52′ N, 2° 10′ W, 85 m ('Manihine' sta. 48), ♀ fragment on microslide, 1948.9.6.2. Tenby, Pembrokeshire, Wales, small colony on microslide, coll. G. Busk, 1899.7.1.6346 (Fig. 7b).

DESCRIPTION. Colony erect but bending, loosely pinnate, monosiphonic; hydrocaulus and hydrocladia uniform in width, both sometimes ending in tendrils; some second order branching, axils *c.* 65°. Hydrothecae biseriate, in opposite pairs, tubular, $\frac{1}{2}$–$\frac{2}{3}$ adnate, gradually out-turned; aperture circular, rim even with deep notch on inner side; operculum approximately circular, attached on inner side, in present material apparently folded along mid-line with 'convex' surface outward. Hydranth with *c.* 16 tentacles; hypostome domed (Vervoort, 1949; present material). ♂ gonotheca (not seen) cylindrical, with 6 longitudinal ridges terminating distally in angular points; aperture on small distal cone. ♀ gonotheca 6-sided with 1–3 whorls of 6 spines distally;

spines tubular to conical, angle of insertion variable; aperture on small terminal cone; see also Remarks.

MEASUREMENTS. See Table 4.

Table 4 *Diphasia attenuata.* Measurements in µm

	NE England (Neotype)	S England (1897.8.9.22)	W Scotland (1971.5.11.34)
Hydrotheca			
Inner side, length adnate	310–340	330–380	260–340
Inner side, length free	200–280	380–420	270–320
Maximum diameter	120		
♀ Gonotheca			
Length (to ends of spines)	1950–2250	2350–2500	2250 (1 only)
Maximum diameter (excluding spines)	450–650	600–800	660

VARIATIONS. Both the present species and *D. rosacea* (p. 269) vary in the abruptness of the outward flexure in the hydrotheca, in the hydrothecal length : breadth ratio, in the robustness of the colony and in the structure of the ♀ gonotheca (for variations in which see Remarks).

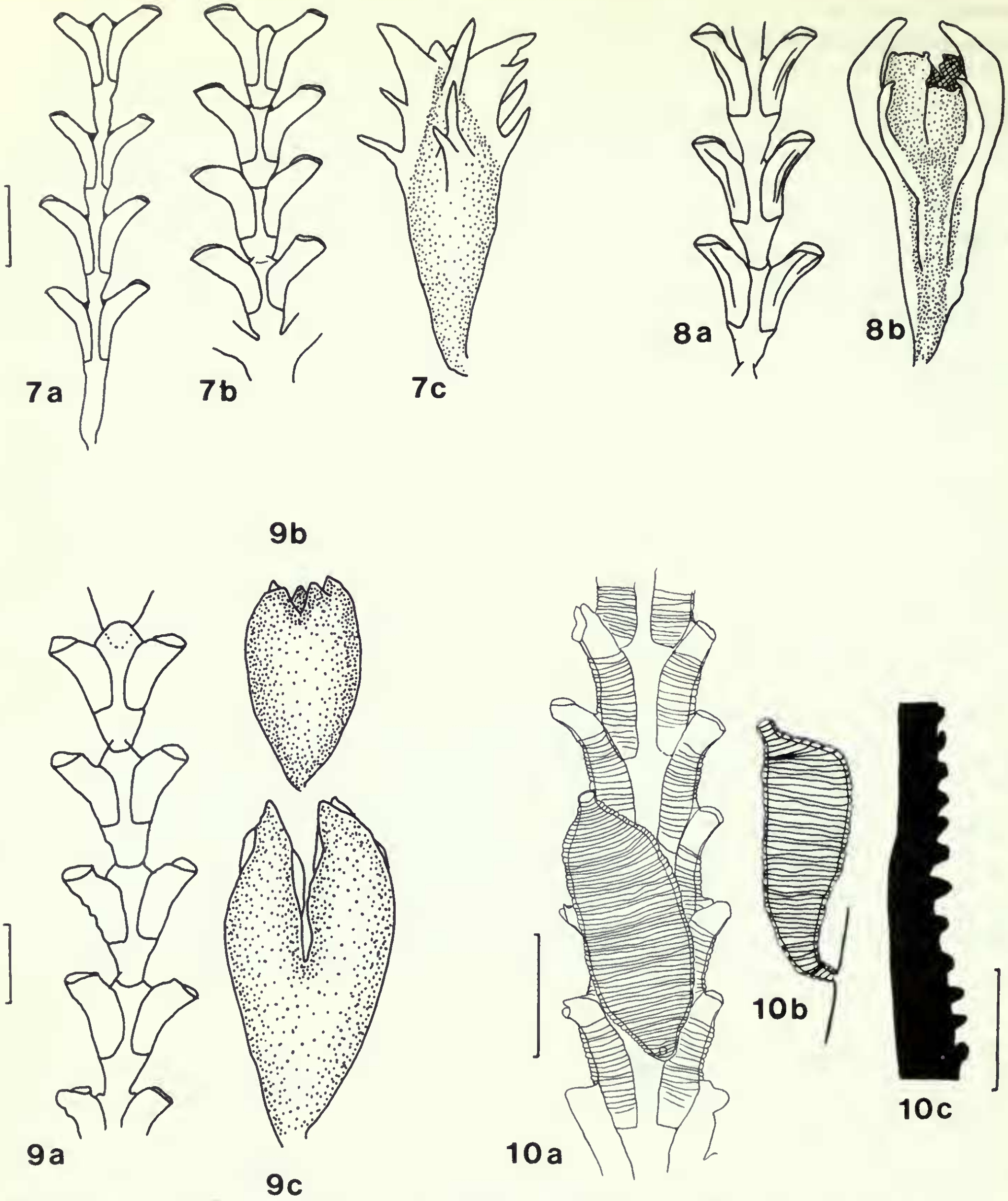
REPRODUCTIVE SEASON. Developing gonothecae found in July off Jersey (Vervoort, 1949); fertile material recorded May–September in NW France (Teissier, 1965). The fertile Mull specimen listed above was collected on 1 October 1970, and the Yorkshire specimen, which had an empty gonotheca, on 7 November 1921.

DISTRIBUTION. Found throughout the present area, but most frequent in the south and west. Common on both north and south coasts of the English Channel and in the Scilly and Channel Isles; and frequent in the southern North Sea[2] (Vervoort, 1949; Hamond, 1957; Marine Biological Association, 1957; Teissier, 1965; Robins, 1969), though unusual off Belgium (Leloup, 1952). Recorded also from Filey, Whitby and Peterhead (Hincks, 1868); Loch Lorn and the Sound of Canna (Rees & Thursfield, 1965); the Clyde Sea (Ritchie, 1911; Chumley, 1918), Isle of Man (Bruce *et al.*, 1963); Anglesey (K. Hiscock, pers. comm.); Bardsey (Knight-Jones & Jones, 1956); Pembrokeshire (Crothers, 1966); several localities in Eire and Northern Ireland (Stephens, 1905; also BM(NH) collection). There is BM(NH) material from the Shetlands, and Kramp (1929) recorded the species from the Faroes.

Table 5 Provisionally accepted differences between the two nominal species *Diphasia attenuata* and *D. rosacea*, arranged so far as understood in decreasing order of importance

Character	*D. attenuata*	*D. rosacea*
♀ gonotheca	1–3 whorls of 6 spines irregularly arranged; no brood chamber; no inequality of spines within a whorl†	Eight distally-directed terminal spines enclosing brood-chamber; two of spines longer than rest†
Terminal tendrils	Often present	Rarely present
Hydrotheca	No grooves	Three grooves on outer wall (Leloup, 1952; Vervoort, 1959)
	Narrower	Broader
	Notch less wide	Rim with wide adcauline notch
Recording breeding season in W Europe	May–early October, possibly till early November	April–June, sometimes September

† But see p. 259.



Figs 7–10. Fig. 7 *Diphasia attenuata.* (a–b) hydrocladia, (a) NE England (1956.2.2.7) and (b) SW Wales (1899.7.1.6346); (c) ♀ gonotheca, W Scotland (1971.5.11.34); scale (a–c) = 500 µm. **Fig. 8** *D. rosacea.* (a) hydrocladium and (b) ♀ gonotheca, W Scotland (1956.1.1.17); scale as Fig. 7. **Fig. 9** *D. fallax.* (a) hydrocladium, (b) ♂ gonotheca and (c) ♀ gonotheca, monoecious colony, Faroe–Shetland Channel (1964.8.7.113); scale (a–c) = 500 µm. **Fig. 10** *D. delagei.* (a) hydrocladium with gonotheca, (b) lateral view of same gonotheca and (c) optical section of hydrothecal wall, external surface on right; all NW France (a–b, L. Cabioch personal collection; c, 1972.12.21.1); scales (a–b) = 500 µm, (c) = 50 µm.

The species is probably unrecorded from Denmark and the Baltic Sea (Stechow, 1927; Broch, 1928; Kramp, 1935).

HABITAT. Usually on other hydroids (Hincks, 1868); offshore, probably common at least to edge of Continental Shelf since Broch (1918) recorded material from a depth of 1470 m.

REMARKS. This species and *D. rosacea* (p. 269) are very similar but their separation is provisionally upheld on the basis of the characters in Table 5. However, all the characters seem variable and some specimens, particularly those lacking ♀ gonothecae, may be difficult to assign. Further, variations in the ♀ gonotheca of the two species approach each other, and gonothecal spines of the *attenuata* type may be joined by longitudinal ridges and tend to point upwards, recalling the arrangement in *rosacea*.

Diphasia delagei Billard, 1912

(Fig. 10)

Diphasia delagei Billard, 1912 : 466–467, figs 3–4; Billard, 1931 : 246–247; Teissier, 1965 : 22.

TYPE LOCALITY. Off Saint-Pol, NW France, 65 m; 4 August 1909; material not located.

MATERIAL EXAMINED. Numerous colonies, 8 miles NW of I de Batz, nr Roscoff, NW France, 85 m, September 1965, on *Diphasia rosacea*, coll. J. Bouillon & L. Cabioch, BM(NH) reg. no. 1972.12.21.1 (Figs 10a–c, Table 6).[3]

Table 6 *Diphasia delagei.* Measurements in μm

(I) Hydrocladia with vertically overlapping hydrothecae

	Type series, NW France (Billard, 1912)	NW France (1972.12.21.1)[†]
Hydrotheca		
Inner side, length adnate	400–580	500–550
Inner side, length free	80–110	60–80
Diameter	110–120	140–170
Gonotheca		
Length		1150 (one only)[†]

(II) Hydrocladia with vertically separated hydrothecae

	Type series, NW France (Billard, 1912)
Hydrotheca	
Inner side, length adnate	270–300
Inner side, length free	160–220
Diameter	100–160

[†] The measured gonotheca, although part of this series, was not registered (see Material examined).

DESCRIPTION. Branching stolon with erect hydrocauli, 25–35 mm. Hydrothecae usually absent from basal portion; in opposite pairs, separated laterally, often sub-opposite; tubular, $\frac{3}{4}$–$\frac{7}{8}$ adnate; 15–30 fine horizontal ridges on outer wall, 5–6 μm, high on outer edge, shallower towards inner side (Fig. 10); hydrothecal aperture circular, even, with single-flapped operculum attached on inner side. Hydranth contracted in present material, *c.* 15 tentacles. Gonotheca (hitherto undescribed) in present material elongate, with narrow terminal aperture at end of short eccentric tube; closely ridged throughout as hydrotheca; borne on hydrocladium on short pedicel just above base of hydrotheca; no gonothecal contents in present material.

MEASUREMENTS. See Table 6.

VARIATIONS. Billard (1912) reported that in some colonies only three-quarters of the inner wall of the hydrotheca was adnate and hydrothecal pairs were vertically distinct, while in others hydrothecae of one pair overlapped the bases of the next and about seven-eighths of the inner walls were adnate. Billard reported between-colony variations also in the lateral extent of the fine ridges on the surface of the hydrotheca. In the present material hydrothecae on a single hydrocladium projected by a varying amount and the precise proportion of the hydrothecal wall which is adnate in this species seems to have little systematic importance.

REPRODUCTIVE SEASON. September in NW France (Teissier, 1965). The present material, collected September 1965, had a single empty gonotheca. The apparent scarcity of gonothecae might indicate that reproduction is usually vegetative in this species, but present information is scant.

DISTRIBUTION. Apparently recorded from only a few localities in NW France and (Teissier, 1965) from the 'axial region of the English Channel', being recorded from nowhere else in the world.

HABITAT. Recorded on other hydroids [*Aglaophenia tubulifera* Hincks, 1861 (by Billard, 1912), *Diphasia margareta* (by Billard, 1931, as *D. pinaster*), *D. rosacea* (present material), 'other hydroids' (Teissier, 1965)] and on pebbles, gravel and shell-gravel (Teissier, 1965). Recorded from depths of 60–90 m (Teissier, op. cit.; other authors' records falling within these limits).

REMARKS. It is not clear why a distinctive species such as *D. delagei* should be so infrequently reported in a well-worked area like the western English Channel, or why it was not reported before 1912.

Several nominal species of *Diphasia*[4] having fine transverse ridges on the hydrotheca have been described from the Atlantic Ocean, but only two or perhaps three seem valid. *Diphasia tropica* Nutting, 1904, from the West Indies, was based on vegetative characters but the gonotheca is now known (Vannucci, 1949, as *Diphasiella ornata* sp. nov., from Colombo; van Gemerden-Hoogeveen, 1965) and the species seems well founded. *Sertularia hupferi* Broch, 1914, resembles *D. tropica* closely in vegetative characters and as suggested by Buchanan (1957) the two might well prove conspecific.[5] *Sertularia subtilis* Fraser, 1937, from Puerto Rico, described without gonotheca, resembles *D. tropica* closely on vegetative characters and might well prove conspecific. Secondly, *Geminella subtilis* Vannucci Mendes, 1946 (*non* Fraser, 1937), from Brazil, resembles *D. tropica* in vegetative characters but the described gonotheca is quite different. However, available evidence does not rule out the possibility that the two gonothecal types (of *D. tropica* and *G. subtilis*) are merely male and female of the same species. Finally, the present species, *Diphasia delagei* Billard, 1912, known only from the western English Channel, differs markedly from *D. tropica* in both vegetative and gonothecal characters and seems to be valid.

Diphasia fallax (Johnston, 1847)

(Fig. 9)

Sertularia fallax Johnston, 1847 : 73–74, pl. 11, figs 2, 5–6 (? syn. *Dynamena tubiformis* Lamouroux, 1821; see Remarks); Gray, 1848 : 71.
Diphasia fallax: Hincks, 1868 : 249–251; pl. 49, figs 2, 2a–b, text-fig. 31; Broch, 1918 : 108–111; Kramp, 1932 : 49–51 (syn. *D. wandeli* Levinsen, 1893); Kramp, 1935 : 181–182, fig. 75; Fraser, 1944 : 242, pl. 50, fig. 227a–c; Naumov, 1960 : 333–334, figs 223–224; Rees & Thursfield, 1965 : 120–121; Naumov, 1969 : 360–361, figs 223–224; Vervoort, 1972 : 103–105, fig. 31.
Diphasia fallax forma *wandeli:* Kramp, 1932 : 51.
Diphasia fallax forma *typica* Kramp, 1932 : 51.
Diphasia coronifera Allman, 1872 : 170 (nom. nud.); Allman, 1874a : 471, 474, pl. 66, figs 2, 2a; Rees & Thursfield, 1965 : 120.
Nigellastrum coroniferum: Stechow, 1923 : 160.

TYPE LOCALITIES AND MATERIAL. Extant type material and its localities are shown in Table 7. In addition, the syntype series originally included material from the coast of Aberdeen (coll. J. Macgillivray) and Scarborough, Yorkshire (coll. W. Bean), but this material was not located. The type locality can be restricted to the NE coast of Britain between Scarborough and Aberdeen, the limits of the original type series.

Table 7 *Diphasia fallax.* Syntype specimens extant in the BM(NH) collection. All are on herbarium sheets; see also text.

Locality	Collector	Gray (1848) cat. no.	BM(NH) reg. no.	Remarks
Dunstanburgh, Northumberland	R. Embleton	6a	1847.9.22.24a	Epizoic on lectotype of *Sertularia fusca* Johnston, 1847 (see p. 278)
Firth of Forth	J. Coldstream	6b–d	1847.9.22.29	
Whitburn, Durham	Miss M. Dale	6e	1847.9.22.31	Labelled 'Whitburn, Northumberland' in Johnston's hand, presumably in error
No data	G. Johnston	6f	1847.9.22.30	Probably correctly regarded a syntype

Other type material examined. Holotype of *Diphasia coronifera* Allman, 1874*a* [BM(NH) reg. no. 1912.12.21.108; see Remarks and Table 8].[6]

Other material examined. This species is well represented in the BM(NH) collections and only mentioned, measured or illustrated material is listed here. Faroe–Shetland Channel, 61° 12′ N, 6° 33′ W ('Goldseeker' sta. 17), 10 Aug 1907, monoecious fragments on microslide, ex. coll. J. Ritchie, 1964.8.7.113 (mentioned, Rees & Thursfield, 1965 : 120) (Figs 9a–c; Table 8). Firth of Lorn, Argyll, Scotland, 140–160 m, monoecious colonies in spirit, coll. J. Murray, 1888.6.9.16. Farland Pt, Gt Cumbrae Id, Buteshire, Scotland, 5–10 m, 20 May 1955, several fertile colonies in spirit + 1 microslide preparation (♀), coll. W. J. Rees, 1956.1.1.4 (Table 8). Also examined was non-type material labelled '*Diphasia coronifera*' Allman, 1874*a*, from the Royal Scottish Museum, collected by James Ritchie and listed by Rees & Thursfield (1965).

Description. Colony erect, pinnate, up to *c.* 100 mm; monosiphonic main stem and branches straight to gently curved, some second order branching; terminal tendrils frequent, used (Hincks, 1868; Naumov, 1969) for attachment. Main stem thicker than branches. Hydrothecae biseriate, often triseriate in arctic regions (Kramp, 1932), opposite to sub-opposite, on both stem and branches; short, tubular, ¾+adnate, slightly out-turned distally; aperture circular, rim even, 1-flapped operculum attached on inner side. Perisarc annulus below each pair of hydrothecae.

Table 8 *Diphasia fallax.* Measurements in μm

	Russian seas (Naumov, 1969)	W Scotland (1956.1.1.4)	Faroe–Shetland Channel (1964.8.7.113; monoecious colony)	Holotype of *Diphasia coronifera* (1912.12.21.108; see Remarks)
Hydrotheca				
Inner side, length adnate	600–650	520–610	380–430	600
Inner side, length free		135–160	170–210	160
Maximum diameter		190–220	200–210	270
♂ gonotheca				
Length	900		1200 (1 only)	1200
Maximum diameter	400		650 (1 only)	700
♀ gonotheca				
Length	2000	2800–3100	2200–2450	
Maximum diameter	1000	950–1350	1050–1200	

Hydranth with *c.* 16 tentacles (Vervoort, 1946). Gonothecae on hydrocladia, attached below each hydrothecal pair. ♂ elongate, wider distally, with 4 erect spines (one to all of which may be bifid) surrounding the raised tubular aperture. ♀ similar but longer, with distal slender neck bearing terminal aperture, and four long conical processes arising from the four distal corners of the gonotheca joined above aperture to form brood chamber surrounding an acrocyst. Monoecious material reported several times but dioecious condition seems more usual (see Remarks).

MEASUREMENTS. See Table 8.

VARIATIONS. Kramp (1932) proposed that arctic forms of this species, having almost entirely sunken hydrothecae with strong tendency to bifid male gonothecal cusps and thick, dark main stems, should be referred to a variety, *wandeli* Levinsen, 1893 (based on the nominal species *Diphasia wandeli* Levinsen). Colonies more typical of warmer regions, having further projecting hydrothecae, male gonothecal cusps not bifid and paler (? younger) main stems he referred to a variety *typica* Kramp, 1932. It seems that the name *coronifera* Allman, 1874*a*, would have priority over *wandeli* (see Remarks); but Kramp showed the two 'formae' to be linked by a continuous series and it seems unnecessary to refer the extremes of the series to different taxa. No varieties are recognized here.

REPRODUCTIVE SEASON. Apparently no published information. Two fertile BM(NH) specimens were collected on 10 July 1907 in the Faroe–Shetland Channel (1964.8.7.113) and on 20 May 1955 from the R Clyde, W Scotland (1956.1.1.4).

DISTRIBUTION. A northern species which in the present area is probably widespread north of a line approximately between Glasgow and Hamburg but currently scarce or absent to the south. During the present century in British waters the species has not been recorded south of the R Clyde and Yorkshire (Ritchie, 1911; Broch, 1918; Chumley, 1918), although recorded present in the 'North Sea', Skagerrak and Kattegat (Broch, 1928; Kramp, 1935). Several nineteenth century records suggest the species then occurred further south [Ireland (Stephens, 1905); Isle of Man (Moore, 1937); N Wales (Penmaenmawr to Rhyl) in 1894 (Marine Science Laboratories, University College of North Wales, Bangor, unpublished records, via K. Hiscock); Holland (Vervoort, 1946); Channel Isles (Ansted & Latham, 1862, dubious record)]. However, Hincks (1868) recorded no localities further south than Yorkshire and Argyll. Thus the scant evidence available suggests that the species extended its range southwards during the last 30 years of the nineteenth century and later retreated to its original southern limit, but this is far from proven.

HABITAT. Naumov (1969) recorded a depth range of 13–250 m in Russian seas, with usual limits of 100–200 m. BM(NH) material suggests that in western Europe the species sometimes occurs in depths of only a few tens of metres, and although precise data are lacking it seems that the depth range in western Europe is similar to that in Russian seas as stated by Naumov.

Vervoort (1972) recorded colonies growing on hydroids of the genera *Aglaophenopsis* and *Salacia*.

REMARKS. The fragments from the Faroe–Shetland Channel and the colonies from the Firth of Lorn, Scotland, are monoecious, supporting Hincks' (1868) observation that this species sometimes bears male and female gonothecae on one colony. However, the bulk of the BM(NH) material is dioecious suggesting that this condition is usual.

When introducing the present species name Johnston (1847) tentatively included in its synonymy the older name *Dynamena tubiformis* Lamouroux (1821 : 12, pl. 66, figs 6–7). Lamouroux' collections were largely destroyed during the Second World War (Redier, 1967) but Billard (1909) had previously examined the type material of the present species. This material had been illustrated by Lamouroux. Billard considered it to be referable to an earlier species, *D. sertularioides* Lamouroux (1816 : 178), type material of which Billard examined, and also illustrated for the first time. Billard referred *sertularioides* (and of course with it *tubiformis*) to the genus *Synthecium* Allman, 1872, in the family Syntheciidae. Hence it seems usage of the species name *fallax* is not threatened by the two Lamouroux names; both of which were in fact applied to Australasian material.

Diphasia coronifera Allman, 1874*a*, was founded on male material resembling *D. fallax* in all features except, it was said, its eight projections (not four) surrounding the male gonothecal aperture. However, many of the male gonothecae on the holotype[6] bear four bifid projections, not eight undivided ones; while the present *D. fallax* material from W Scotland (1888.6.9.16) bears some male gonothecae with four simple projections, others with four bifid projections and still others intermediate, with one, two or three bifid projections. In addition, measurements of the holotype fall within the range of *D. fallax* dimensions (Table 8). Hence it seems that *D. coronifera* was based on typical *D. fallax* material, and the two taxa can be regarded conspecific. The non-type material in the James Ritchie collection of the Royal Scottish Museum, listed as *D. coronifera* by Rees & Thursfield (1965), was examined and found also to be *D. fallax*. *Thuiaria coronifera* Allman, 1876, originally described from material collected in Japanese waters, is a different species. It has recently been redescribed by Naumov (1960, 1969).

Diphasia margareta (Hassall, 1841)

(Fig. 11)

Sertularia margareta Hassall, 1841 : 284, pl. 6, figs 3–4; Johnston, 1847 : 72–73, text-fig. 13 [syn. *S. tudori* Rylands, in Johnston, 1847 (sic)].
Diphasia pinaster: Hincks, 1868 : 252–253, pl. 50, fig. 1; Teissier, 1965 : 22.
Diphasia elegans Sars, 1874 : 145–146, pl. 3, figs 23–26.
Diphasia pectinata: Vervoort, 1959 : 255–256, figs 23–24 (see p. 267).

TYPE LOCALITIES AND MATERIAL. Off Howth, near Dublin, Eire, and near Giant's Causeway, near Runkerry Point, Co Antrim, Northern Ireland. The type material was not located. As noted by Hinckss (1868) the original description appears to have been of female material. See addendum.

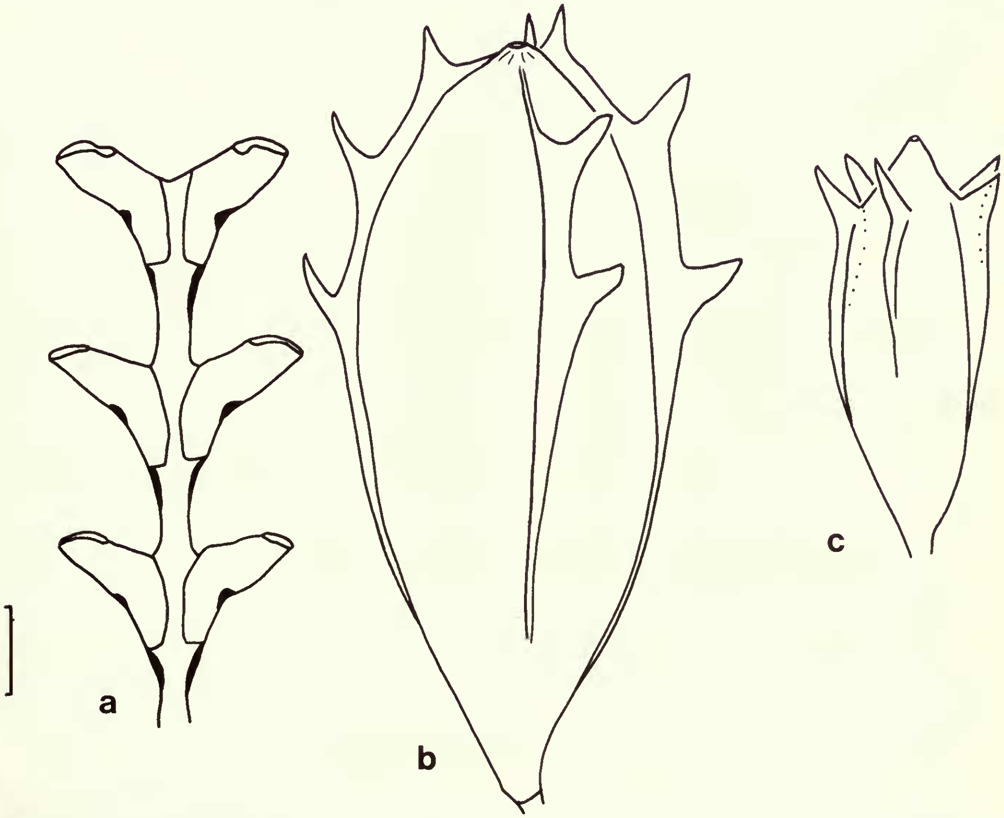


Fig. 11 *Diphasia margareta.* (a) terminal region of hydrocladium, North Sea (1964.8.7.114); (b) ♀ gonotheca, Azores (1888.11.13.52); (c) ♂ gonotheca with fifth, supernumerary spine, W Scotland (1955.10.15.5); scale (a–c) = 500 μm.

MATERIAL EXAMINED. Only measured, illustrated or otherwise mentioned material is listed. Campbeltown, Argyll, Scotland, 10 Jun 1952, fragments of ♂ colony on microslide, coll. R. B. Pike, 1955.10.15.5 (Fig. 11c; Table 9). W of Shetland Isles, 60° 02′ N, 3° 13′ W, 160 m, 19 Jun 1906, fragments of ♀ colony on microslide, coll. R.V. 'Goldseeker' (sta. 21a), via. J. Ritchie coll., 1964.8.7.114 (Fig. 11a; Table 9; mentioned, Rees & Thursfield, 1965 : 122, as *D. pinaster*). Peel, Isle of Man, ♀ hydrocaulus on microslide, ex E. T. Browne coll., 1961.11.4.31 (Table 9). Off Azores, 38° 38′ N, 28° 28½′ W, 900 m, Jun 1873, ♂ and ♀ fragments on microslide, coll. H.M.S. 'Challenger' (sta. 75), 1888.11.13.52 (Fig. 11b); mentioned, Allman, 1888 : 64, as *D. pinaster*).

DESCRIPTION. Colony erect, up to 150 mm, pinnate, side branches alternate, rather long, some second order branching. Hydrothecae on both stem and branches biseriate, opposite, grading proximally to sub-opposite, sharply out-turned in middle, ½–¾ adnate; inward projection of perisarc at angle of bend; shape of inward projection varies (Fig. 11a), sometimes (Vervoort, 1959) two projections; aperture oblique, circular, even rimmed, usually with adcauline notch; operculum circular, adcauline. Angle between inner edge of hydrotheca and hydrocaulus approximately 90°, although variable. Some hydrothecal renovation. Gonothecae – ♀ very large, elongate-ovoid, not pedicellate (Philbert, 1934), tetrangular, domed distally, with two [sometimes one (Vervoort) or three (Philbert)] spines on each edge near apex; internal structure complicated, described by Philbert; ♂ smaller than ♀, ovate, tapered basally, pedicellate (Philbert), tetrangular, with spine on each distal corner; aperture terminal, circular, raised.

MEASUREMENTS. See Table 9.

Table 9 *Diphasia margareta*. Measurements in μm

	SW Scotland (1955.10.15.5)	Isle of Man (1961.11.4.31)	North Sea (1964.8.7.114)
Hydrotheca			
Inner side, length adnate	400–420	450–500	550–560
Inner side, length free	390–410	450–500	520–540
♂ gonotheca			
Length	2100–2500		
Maximum diameter	700–900		
♀ gonotheca			
Length		3700–3800	3500–4000
Maximum diameter		1250–1300	1300

VARIATION. See Description.

REPRODUCTIVE SEASON. Fertile material recorded June–September in NW France (Teissier, 1965, as *D. pinaster*).

DISTRIBUTION. Recorded throughout the present area, but commonest in the south. Published and other records (mostly as *D. pinaster*) additional to the type localities include: 'most of the British Isles' (Hincks, 1868), Isle of Man (Bruce *et al.*, 1963), Clyde Sea (Ritchie, 1911; Vervoort, 1942), Strangford Lough, Northern Ireland (Williams, 1954), E & SW Eire (Stephens, 1905) S Devon (Marine Biological Association, 1957), Durham coast (Norman, 1905), Roscoff but no further East (Tessier, 1965), N Denmark, Kattegat & Norway S of Bergen (Kramp, 1935), strandline at Reculver, north Kent, 1970 (original).

HABITAT. Recorded (as *D. pinaster*) from depths greater than 75 m in W English Channel (Marine Biological Association, 1957; Teissier, 1965), down to 900 m in the Azores (Allman, 1888). These and other records indicate that the species is characteristically found in waters deeper than *c.* 75 m. Association with '*Smittina*' (Bryozoa) community noted by Teissier.

Remarks. Nomenclature of the present species is discussed on pages 265, 267 and 269. *Diphasia elegans* Sars, 1874, is here considered conspecific.

Diphasia nigra (Pallas, 1766)
(Fig. 12)

Sertularia nigra Pallas, 1766 : 135–136; Johnston, 1838 : 128–130, text-fig. 13 [but not text-fig. 15, = holotype of *S. fusca* Johnston, 1847 (see Remarks under *Salacia articulata*, p. 279)]; Johnston, 1847 : 68–69, text-fig. 10, pl. 12, figs 1–2; Landsborough, 1852 : 126–127.
? *Sertularia pinnata* Pallas, 1766 : 136–137 (binominal for Baster, 1762 : pl. 1, figs 6a–b; ? = *S. cupressina* Linnaeus, 1758; see Remarks).
Sertularia pectinata Lamarck, 1816 : 116; Lamouroux, 1816 : 187 (see Remarks).
Sertularia pinnata: Johnston, 1847 : 69–70, pl. 12, figs 3–4 (syn. *S. fuscescens:* Turton, 1802); Landsborough, 1852 : 127 [non *Sertularia pinnata* Linnaeus, 1758 : 813, and Ellis & Solander, 1786 : 46–47 (= *Kirchenpaueria pinnata*, F. Plumulariidae; see Remarks); Templeton, 1836 : 468 (= *Sertularella gayi;* see p. 287)].
Diphasia pinnata: Hincks, 1868 : 255–257, pl. 52 (syn. *Sertularia nigra* Pallas); Vervoort, 1946 : 232–234, fig. 100 [syn. *S. nigra* Pallas, 1766; *Nigellastrum nigrum* Oken, 1815; *S. fuscescens* Linnaeus, 1791; *S. pectinata* Lamarck, 1816 (here referred to *Diphasia pinastrum* Cuvier, 1830; see p. 267)].
Diphasia nigra: Millard, 1975 : 261.
non *Diphasia pectinata:* Vervoort, 1959 : 255–256, figs 23–24 (= *D. margareta;* see Remarks).

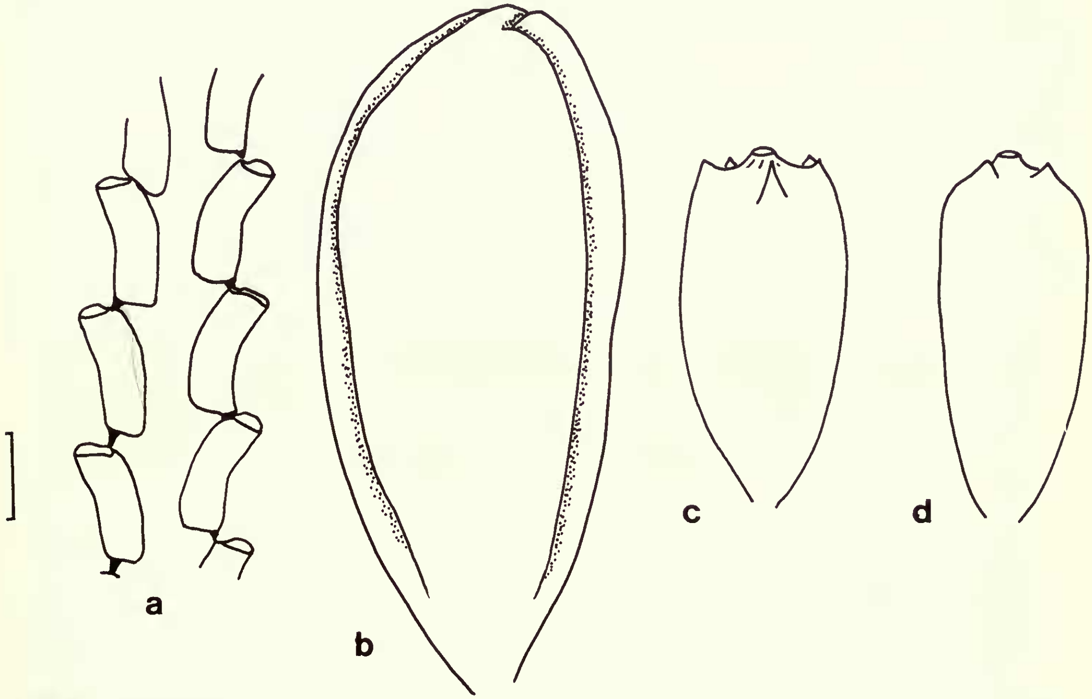


Fig. 12 *Diphasia nigra.* (a–b) part of hydrocladium and ♀ gonotheca, Bay of Biscay (1961.11.4.9); (c–d) two adjacent ♂ gonothecae with 5 and 2 terminal cusps, uncertain locality (1899.7.1.6344); scale (a–d) = 500 μm.

Type locality and material. Pallas based his description of *Sertularia nigra* on material from the 'Indian or American Oceans' growing on '*Mytilus margaritiferis*'[7] shells which he had seen in 'Belgian Museums', and some material of his own collected from the Lizard Peninsula, Cornwall, England. The type locality is here restricted to the Lizard Peninsula. None of the type material was located (see also Remarks).

TYPE MATERIAL OF OTHER NOMINAL SPECIES EXAMINED. *Sertularia pectinata* Lamarck, 1816 : 116; 'l'Océan des Grandes-Indes' [Indian Ocean]; collected by P. Sonnerat, presented to Lamarck; several fragments on microslide, Mus. nat. d'Hist. Nat., Paris, collection; mentioned, Billard, 1907 : 218.

NON-TYPE MATERIAL EXAMINED. Only measured, illustrated or otherwise mentioned material is listed. Guernsey, 1906, infertile colony in spirit, ex coll. A. M. Norman, 1912.12.21.117 (see comment under Distribution). Bay of Biscay, 48° 24′ N, 6° 33′ W, 150 m, Aug 1906, part of ♀ colony on microslide, coll. E. T. Browne, 1961.11.4.9 (Fig. 12a–b; Table 10); mentioned, Browne, 1907 : 16–17). 'Sydney, Australia', fragments of ♂ hydrocladia on microslide, ex coll. G. Busk, det. T. Hincks, 1899.7.1.6344 (Fig. 12c–d; Table 10; mentioned, Bale, 1884 : 99[8]).

DESCRIPTION. Colony large, up to *c.* 200 mm, robust, erect, rigidly pinnate, main stem thicker than the alternate side-branches; said (Hincks, 1868; Browne, 1907) to be deep red (carmine) to pink in life, preserved colonies being dark brown to black. Hydrothecae tubular, adnate, gently outcurved; rim even, operculum circular, attached on inner side; alternate, vertically contiguous or nearly so. ♂ gonotheca ovate, tapering basally to very short pedicel, terminal aperture on short cone surrounded by usually 4 (2–5 in present material) blunt spines. ♀ larger than ♂, obpyriform, without pedicel, with 4 longitudinal grooves meeting distally; internal structure described by Philbert (1934).

MEASUREMENTS. See Table 10.

Table 10 *Diphasia nigra*. Measurements in μm

	Locality uncertain (see material list; 1899.7.1.6344)	Bay of Biscay (1961.11.4.9)
Hydrotheca		
Length	600	480–530
Diameter	180	140–155
♂ gonotheca		
Length	1800	
Maximum diameter	850	
♀ gonotheca		
Length		4400
Maximum diameter		1700

REPRODUCTIVE SEASON. Fertile material recorded April–May off SW England (Marine Biological Association, 1957), June–September off NW France (Teissier, 1965), August in Bay of Biscay (Browne, 1907).

DISTRIBUTION. A warm water Atlantic species recorded in the present area only from SW England (Pallas, 1766; Hincks, 1868; Marine Biological Association, 1957) and NW France (Teissier, 1965). It has also been reported from the Glenan Isles, just south of the present faunal boundary (Fey, 1969). The BM(NH) specimen labelled 'Guernsey, 1906' lacks tissues so it might have drifted there, and the species was not recorded from the Channel Isles in the faunal survey of Vervoort (1949). Although recorded from the Netherlands in the eighteenth and nineteenth centuries, authentic material is apparently lacking (Vervoort, 1946) and the species has not been reported there this century.

HABITAT. Recorded from *c.* 80 m depth in the western English Channel (Marine Biological Association, 1957; Teissier, 1965); reported on bivalve shells (Pallas, 1766) and presumably occurs on other, similar substrates.

REMARKS. The present species has been known as *Diphasia pinnata* for the past 100 years[9] but it seems that this combination is inadmissible. The two nominal species *Sertularia pinnata* Pallas, 1766, and *S. nigra* Pallas, 1766, have been regarded conspecific by several authors[10] (e.g. Hincks, 1868; Bedot, 1901; Vervoort, 1946). Hincks, who was the first reviser, adopted the specific name *pinnata* and this has been widely followed; but *Sertularia pinnata* Pallas, 1766, is actually a junior primary homonym of *Sertularia pinnata* Linnaeus, 1758,[11] a plumularid currently referred to the genus *Kirchenpaueria* Jickeli, 1883 (for example by Rees & Thursfield, 1965). Thus the name *pinnata* Pallas, 1766, should not be used, leaving the once more widely used *nigra* available for the present species. In fact it is doubtful whether the two Pallas species are conspecific. *S. pinnata* Pallas was based on two illustrations of Baster (1762 : pl. 1, figs 6a–b). One illustration, of a pinnate colony, shows downward-curving branches unlike the straight, rigid branches of the present species; while the other shows gonothecae with two latero-distal horns, again unlike those of the present species. Although Vervoort (1946 : 233) likened Baster's illustrations to *Sertularia cupressina* Linnaeus, 1758, it seems that only the illustrated gonothecae resemble that species and that the illustrations as a whole should best be regarded as indeterminate. *S. pinnata* Pallas, 1766, based on them, should therefore also be regarded as indeterminate. The alternative, of referring the illustrations and hence *S. pinnata* Pallas to *S. cupressina* Linnaeus, has in fact no nomenclatural consequences since *S. pinnata* Pallas is in any case a junior homonym (see above). *S. nigra* Pallas, 1766, was not originally illustrated, but as the original diagnosis mentions sub-opposite hydrothecae and large, quadrangular gonothecae it seems that Hincks (1868) and other authors correctly identified their concepts of the present species with *S. nigra*, albeit employing the name *S. pinnata*.

The name *Sertularia pectinata* Lamarck, 1816, was applied by Bedot (1901 : 503) and Vervoort (1959 : 255–256) to the species here called *Diphasia margareta* (p. 263). However, as noted by Billard (1907 : 218), the holotype of *S. pectinata* Larmarck, re-examined here, is referrable to the present species (see also Remarks under *D. pinastrum*, p. 269). In addition to describing *S. pectinata* from type material Lamarck included *S. pinaster* Ellis & Solander, 1786, in its synonymy; but *S. pinaster* sensu Ellis & Solander seems to have been another species (here called *D. pinastrum*, p. 267). Lamarck evidently did not think that his new material and Ellis & Solander's account were of different species, but he seems to have been mistaken.

The homonym *Sertularia pectinata* Lamouroux, 1816 : 187, was considered to have been applied to indeterminate material by Bedot (1901 : 503); but Lamouroux *et al.* (1824 : 680) had already regarded it a synonym of the *S. pectinata* of Lamarck, 1816, and their view is followed here.

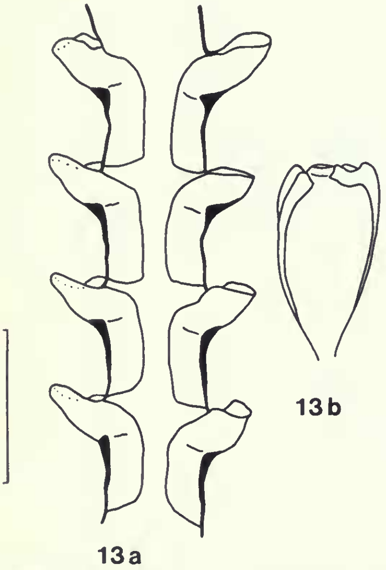
Diphasia pinastrum (Cuvier, 1830)
(Fig. 13)

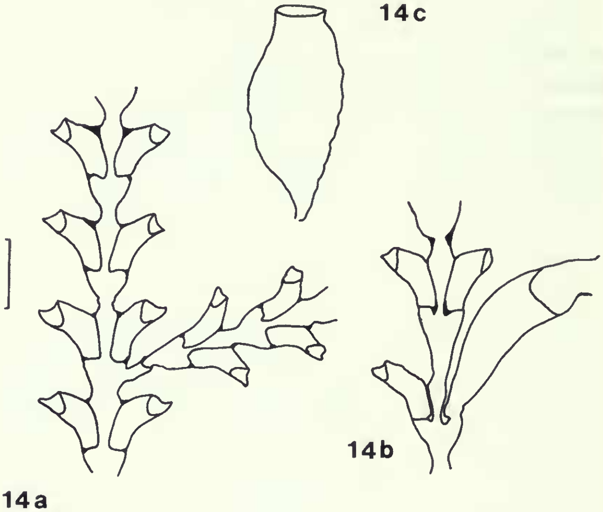
Sertularia pinaster Ellis & Solander, 1786 : 55–56, pl. 6, figs B, b (non *S. pinaster* Lepechin, 1783; see Remarks).
Sertularia pinastrum Cuvier, 1830 : 301 (emend. pro *S. pinaster* Ellis & Solander; see Remarks).
Sertularia alata Hincks, 1855 : 127–128, pl. 2.
Diphasia alata: Hincks, 1868 : 258, pl. 48, figs 2, 2a–b; Browne, 1907 : 31; Broch, 1918 : 144; Kramp, 1935 : 183–184, fig. 76a; Rees & Thursfield, 1965 : 119.
non *Diphasia pinaster:* Hincks, 1868 : 252–253, pl. 50, fig. 1; Kramp, 1935 : 182–183, fig. 76b; [= *D. margareta* (Hassall, 1841); see Remarks].
non *Diphasia pectinata:* Vervoort, 1959 : 255–256, figs 23–24 [= *D. margareta* (Hassall, 1841); see Remarks].

TYPE LOCALITY AND MATERIAL. The type material of *Sertularia pinaster* Ellis & Solander, 1786, is almost certainly no longer extant (Cornelius, 1975*a* : 267, footnote). No locality was given in the original description. The type material of *Sertularia alata* Hincks, 1855, also seems lost. It comprised a fertile colony collected by George Barlee and 'Miss Cutler' in the Shetlands, and sent to Hincks by Miss Cutler. Two infertile colonies of this species collected in the Shetlands by Barlee and sent to A. M. Norman are now in the BM(NH) herbarium collection of Hydroida (reg. nos

1915.4.1.12) and it seems appropriate to select this material as neotype of *S. alata*. Unfortunately there is no evidence that the material was seen by Hincks. No neotype material of *Sertularia pinaster* Ellis & Solander is designated here.

Other material examined. The BM(NH) collections include examples of this distinctive species from a variety of localities within the present area and only the illustrated and measured material is listed here. Firth of Lorn, Argyll, Scotland, 120–140 m, part of infertile colony on microslide, coll. J. Ritchie, 1888.6.9.14 (mentioned, Rees & Thursfield, 1965 : 119, as *D. alata*) (Fig. 13a; Table 11). Bay of Biscay, 47° 48′ N, 7° 25–26′ W, 220 m, Aug 1906, several colonies, some fertile, on microslides, coll. E. T. Browne, 1961.11.14.16, 20 (mentioned, Browne, 1907 : 31, as *S. alata*) (Fig. 13b; Table 11).





Figs 13–14. **Fig. 13** *Diphasia pinastrum.* (a) hydrocladium, W Scotland (1888.6.9.14); (b) ♀ gonotheca, Bay of Biscay (1961.11.14.20); scale (a–b) = 500 μm. **Fig. 14** *Dynamena pumila.* (a–b) hydrocladia, one showing unusual hydrotheca, SW England (1975.10.15.3); (c) gonotheca, SE England (1967.10.24.9); scale (a–c) = 500 μm.

Description. Colony robust, erect, usually simply and regularly pinnate but second order branching frequent; main stem thicker than branches. Stem and branches straight, usually monosiphonic but base of stem sometimes (Browne, 1907; Broch, 1918) polysiphonic. Branches alternate, like main stem bearing opposite to sub-opposite hydrothecae in two lateral rows. Hydrotheca long, S-shaped, $\frac{2}{3}$ adnate, distal third sharply out-turned at *c.* 90° with immediate *c.* 45° upward flexure (Fig. 13); internal perisarc thickening at point of 90° flexure, conspicuous in optical section; aperture broad, rim even to sinuous, operculum 1-flapped, attached on inner side. Hydranth undescribed; one BM(NH) specimen had 18 tentacles (1961.11.4.17). Gonotheca ♂ = ♀ (Browne, 1907), roughly cylindrical but quadrangular in section, tapering basally; aperture terminal, raised, surrounded by 4 perisarc ridges ending centrally in rounded points.

Measurements. See Table 11.

Reproductive season. Fertile material recorded April–July in NW France (Teissier, 1965); June off SW England (Marine Biological Association, 1957).

Distribution. Recorded from eastern Atlantic waters from Bergen, Norway (Broch, 1918), to the Azores (Rees & White, 1966). The species might thus be expected to occur in suitable conditions throughout the present area, but published records are from scattered localities and the BM(NH) collections add no new information. All records are listed: Shetlands, Hebrides, Cornwall and S

Table 11 *Diphasia pinastrum*. Measurements in μm

	Bay of Biscay (1961.11.4.16)	W Scotland (1888.6.9.14)
Hydrotheca		
Inner side, length adnate	380–430	390–410
Inner side, length free	140–170	140–170
Gonotheca (♂ = ♀)		
♀† Length	620–670	
Maximum diameter	300–340	

† Contained ova.

Devon (Hincks, 1868; Marine Biological Association, 1957); N of Shetlands (61° 36′ N, 0° 44′ W) and Firth of Lorn, Argyll (Rees & Thursfield, 1965); Co Cork, Eire (Stephens, 1905); NW France (Teissier, 1965). Probably only once recorded from Denmark (Kramp, 1935) and absent from fauna lists relating to Oslo Fjord and the Baltic (Stechow, 1927; Broch, 1928; Naumov, 1969; Christiansen, 1972).

HABITAT. Waters deeper than 80 m off NW France (Teissier, 1965); 7–60 m off S Devon (Marine Biological Association, 1957); 120–140 m in W Scotland (Rees & Thursfield, 1965). Recorded 'on worm tubes' by Browne (1907) but substrate otherwise apparently not noted.

REMARKS. The similarity in colony habit between this species and that here called *Diphasia margareta* has caused some nomenclatural confusion. The present species was first given a binominal – *Sertularia pinaster* – by Ellis & Solander (1786). However, Vervoort (1959) has pointed out that this name is not available as it is a junior primary homonym of *Sertularia pinaster* Lepechin, 1783, a species currently referred to the genus *Selaginopsis* Allman, 1876. The illustrations provided by Ellis & Solander under *S. pinaster* clearly show their material to have been the species widely known as *Diphasia alata* Hincks, 1855,[12] and not as suggested by Vervoort (1959) that usually called *Diphasia pinaster* (e.g. *sensu* Hincks, 1868). The earliest available name for '*D. pinaster*' *sensu* Hincks seems to be *Sertularia margareta* Hassall, 1841; and that for the present species *Sertularia pinastrum* Cuvier, 1830. (See also Remarks under *D. nigra*, p. 267.)

Diphasia rosacea (Linnaeus, 1758)

(Fig. 8)

Corallina pumila pennata, denticulis terris . . . Ellis, 1755 : 8–9, pl. 4, fig. A, but not fig. C.
Sertularia rosacea Linnaeus, 1758 : 807.
Sertularia nigellastrum Pallas, 1766 : 129–130 (nom. nov. pro *S. rosacea* Linnaeus, 1758).
Diphasia rosacea: Hincks, 1868 : 245–247, pl. 48, figs 1, 1a–c; Broch, 1918 : 112–113; Kramp, 1935 : 182, fig. 74b; Vervoort, 1946 : 230–232, figs 98–99; Vervoort, 1959 : 257–258, fig. 25; Leloup, 1952 : 181–182, fig. 105; Naumov, 1960 : 332–333, figs 221–222; Rees & Thursfield, 1965 : 122; Naumov, 1969 : 358–359, figs 221–222.

TYPE MATERIAL AND LOCALITY. Linnaeus based his designation of this species on fig. A of Ellis' plate (not on fig. C, which in fact appears to represent *D. attenuata* (Hincks, 1866) and which was not given a binominal by Linnaeus). As with some other hydroids in the Linnean genus *Sertularia* it seems Linnaeus based his diagnosis solely on Ellis' illustration and not on material (see p. 251). Linnaeus provided a diagnosis but no description; and cited only Ellis' work. Thus the illustrated specimen, a female colony, can be regarded as holotype. Like other Ellis hydroid material it almost certainly no longer exists (Cornelius, 1975*a* : 267). Ellis' description was based on material from Brighton, Sussex, England, to which the type locality can be restricted.

MATERIAL EXAMINED. Only measured or illustrated material is listed. Vattlestraumen, Espegrend, nr Bergen, Norway, 15–25 m, 13 Apr 1962, ♀ hydrocaulus on microslide, coll. W. J. Rees, 1962.10.7.16 (Table 12). Millport, I of Cumbrae, Bute, Scotland, May 1962, ♀ colony on microslide, coll. W. J. Rees, 1962.6.19.15 (Table 12). Off Washbourne, W Cumbrae, Bute, 15–30 m, 18 May 1955, ♀ hydrocladia on microslide, coll. W. J. Rees, 1956.1.1.17 (Figs 8a–b). Off Wexford, Co Wexford, Eire, 80 m, 26 May 1901, ♂ and ♀ hydrocladia on same microslide (with one infertile hydrocladium of *D. attenuata*), coll. Irish Fisheries Board, via E. T. Browne, 1967.6.15.30 (Table 12).

DESCRIPTION. Colony erect but bending, up to 50 mm, delicate, loosely pinnate, some second order branching, branches and main stem uniform in width; branches often lacking hydrothecae proximally. Hydrothecae opposite to sub-opposite, tubular, $\frac{1}{2}$–$\frac{2}{3}$ adnate, gradually out-turned; aperture circular, rim even with slight notch on inner side; operculum circular, folded longitudinally, attached on inner side. ♂ gonotheca tubular, tapered basally, with 6–8 longitudinal ridges ending distally in blunt spines surrounding a conical process bearing the apical aperture. ♀ gonotheca tubular, tapering basally, with 8 longitudinal ridges ending distally in long inward-curving spines surrounding the central aperture and forming a brood-chamber; an opposite pair of the spines usually longer than the remaining six, and notched on the outer edge.

MEASUREMENTS. See Table 12.

Table 12 *Diphasia rosacea*. Measurements in μm

	SE Eire (1967.6.15.30)	SW Scotland (1962.6.19.15)	W Norway (1962.10.7.16)
Hydrotheca			
Inner side, length adnate	300–390	360–390	320–370
Inner side, length free	350–390	350–400	240–300
Maximum diameter	160–180	130–150	120–140
♂ gonotheca			
Length	1300–1700		
Maximum diameter	450–500		
♀ gonotheca			
Length (to ends of spines)	1800–1900	2000–2300	1800† (1 only)
Maximum diameter (excluding spines)	600–700	750–900	700

† Only one fully developed gonotheca on specimen.

VARIATION. See comments under *D. attenuata* (p. 256).

REPRODUCTIVE SEASON. Fertile material recorded March–April in SW England (Marine Biological Association, 1957), April–June and September in NW France (Teissier, 1965). All fertile BM(NH) material from W Europe was collected in April and May.

DISTRIBUTION. Found throughout the present area, also occurring north to Iceland and south at least to 9° N on the African coast (Vervoort, 1959).

HABITAT. Said to be commonest in the *Laminaria* zone of the sublittoral (Broch, 1918) and in depths shallower than 60 m (Kramp, 1935; Teissier, 1965), although some of the present material came from 80 m depth. The species has been found intertidally in places of fast water movement (Lewis, 1964).

REMARKS. Although this species has been widely regarded as distinctive, the differences from *Diphasia attenuata* are not great (see p. 257 for discussion and also Table 5).

Dynamena pumila (Linnaeus, 1758)
(Fig. 14)

Corallina pumila repens, minus ramosa . . . Ray, 1724 : 37; Ellis, 1755 : 9–10, pl. 5, figs A, a.

Sertularia pumila Linnaeus, 1758 : 807–808; Hincks, 1868 : 260–262, pl. 53, fig. 1; Winther, 1879 : 303–305, pl. 6, figs 1–4, 21–22 (? syn. *S. gracilis* Hassall, 1848, which is here referred to *S. distans* Lamouroux, 1816; see p. 299); Pennington, 1885 : 112–113, pl. 7, fig. 1.

Sertularia bursaria Linnaeus, 1758 : 814–815.

Cellularia bursaria: Ellis, 1768 : 434, pl. 19, fig. 12.

Dynamena pumila: Lamouroux, 1812 : 184; Lamouroux, 1816 : 179; Broch, 1918 : 115–116; Kramp, 1935 : 187–188, fig. 81A (syn. *Sertularia gracilis* auct.); Vervoort, 1946 : 252–254, fig. 110 (syn. *Sertularia pupa* Maratti, 1776; *S. thuia:* Fabricius, 1780; *Nigellastrum pumilum:* Oken, 1815; *Dynamena fabricii* Agassiz, 1860); Naumov, 1960 : 329–330, fig. 219; Naumov, 1969 : 356–357, fig. 219.

Dynamena distans Lamouroux, 1816 : 180, pl. 5, figs 1a, B.

non *Sertularia distans* Lamouroux, 1816 : 191; (see p. 299).

TYPE MATERIAL AND LOCALITY. Linnaeus (1758) gave the type locality as 'in Oceano', although citing the descriptions of both Ray (who gave the distribution as 'British Isles') and Ellis ('shores of Sheerness, Kent' and 'Brighton, Sussex'). Linnaeus' citation of Ellis' account lists only one of Ellis' figures, namely plate 5, fig. A (not fig. a). The illustrated specimen can be identified as the holotype.[13] It was said by Ellis to have been collected at Brighton, to which the type locality can accordingly be restricted. 'Brighton' is interpreted in the sense of the area currently administered by Brighton Borough Council. The area comprises the coast from Brighton town to Peacehaven inclusive. Suitable natural habitats for *D. pumila* do not at present exist on the coast of Brighton town, which is a more restricted area. The holotype specimen is almost certainly lost (Cornelius, 1975*a*) and the following neotype series is substituted: Rottingdean, Sussex, England, mean low tide level of neap tides, 24 June 1975, numerous fertile colonies on *Fucus serratus* L., in spirit, coll. P. F. S. Cornelius & J. Garfath, 1975.9.11.1.

OTHER MATERIAL EXAMINED. This distinctive species is well represented in the BM(NH) collections and only specimens referred to in the text or illustrated are listed here. Gåso Ranna, Gullmarsfjord, W Sweden, 27 Aug 1962, spirit material + 1 microslide preparation, coll. W. J. Rees, 1962.11.8.19. Caol Scotnish, Loch Sween, Argyll, Scotland, 30 May 1962, 1 m, fragment of colony on microslide, coll. W. J. Rees, 1962.6.19.22 (Table 13). Southern end of Lizard Peninsula, Cornwall, ELWST, 6 Oct 1975, fragment on microslide, coll. P. F. S. Cornelius, 1975.10.15.3 (Fig. 14a–b). Jennycliff Bay, Plymouth, Devon, Aug 1963, fragment of colony on microslide, coll. R. C. Vernon, 1967.10.24.14 (Table 13). Hastings, Sussex, 26 Jun 1963, coll. R. C. Vernon, 1967.10.24.9 (Fig. 14c; Table 13).

DESCRIPTION. Creeping stolon from which arise erect stiff monosiphonic hydrocauli up to *c.* 75 mm (Lewis, 1964), usually 50 mm or less; unbranched to sparsely and irregularly branched, sometimes loosely pinnate. Hydrothecae in opposite to sub-opposite pairs, with a nodal constriction between every one, two or three pairs; tubular, curved outwards, $\frac{2}{3}$ adnate; aperture 2-cusped, operculum fragile, 2-flapped, deciduous. Hydranth with 18–20 tentacles, said (Broch, 1918) to lack diverticulum. Gonotheca ♂ = ♀, pedicellate, ovoid, wall sometimes slightly rugose; aperture wide, often on short neck (development of gonophores described by Teissier, 1923); ♀ with *c.* 8 ova, retained in acrocyst; ♂ intracapsular.

VARIATIONS. Preliminary measurements were kindly made by Miss J. Garfath of intertidal material collected by the author from the very exposed and extremely sheltered sides of the peninsula south of Milford Haven, Dyfed (Pembrokeshire), Wales. The more sheltered population had hydrothecae approximately 30% longer and 10% broader than those on the more exposed shore; and exposed shore specimens had thicker perisarc than those from the sheltered shore (unpublished observations). Features of systematic importance were apparently not affected, however.

Broch (1918) found lower shore specimens to be more branched than upper shore ones while Johnston (1847) recorded that sublittoral colonies were more 'delicate' in all structures than those growing intertidally. It is possible, however, that Johnston based his remark on misidentified specimens of *Sertularia distans* Lamouroux.

Measurements. See Table 13.

Table 13 *Dynamena pumila.* Measurements in μm

	SW England (1967.10.24.14)	SE England (1967.10.24.9)	W Scotland (1962.6.19.22)
Hydrotheca			
Inner side, length adnate	270–310	300–320	320–360
Inner side, length free	190–210	210–240	240–270
Maximum diameter	170–190	190–200	180–210
Internode			
Length (one pair of hydrothecae)	600–720	870–920	750–780
Gonotheca (♂ = ♀)			
Length, including pedicel		♂ 1400–1500	♀ 1200–1400
Maximum diameter		570–600	620–670
Diameter of aperture		290–300	350–400

On the date of collection of the fertile neotype material of *D. pumila* colonies of the same species at higher shore levels were infertile and smaller.

An unusual hydrotheca is shown in Fig. 14b.

Reproductive season. Fertile material recorded March–June in the Channel Isles (Vervoort, 1949), April–August in NW France (Teissier, 1965), May–June in the Kattegat (Rasmussen, 1973); May–September in N America (Agassiz, in Hincks, 1868).

Distribution. Usually common on suitable shores and scarce in the sublittoral throughout the area, including the Baltic (Broch, 1918; Stechow, 1923). The species seems currently uncommon on many shores in Kent, England, perhaps in response to local pollution.

Habitat. Characteristically intertidal ('middle and lower shore', Barrett & Yonge, 1958) but recorded also from shallow offshore waters (5 m, NW France, Fey, 1969; 20–30 m, W Sweden, present material; 75 m, Oslo Fjord, Christiansen, 1972). A record from 270 m (Naumov, 1969, apparently repeated in Christiansen, 1972) needs confirmation. The species occurs in brackish waters (Broch, 1918; Kramp, 1929), for example penetrating far into the Baltic (Stechow, 1923) and to the heads of both Scandinavian fjords (Broch, 1918) and Scottish sea lochs. Typically it occurs on fucoid and other algae, but particularly on shores exposed to strong wave action it attaches directly to rock. My own experience of *D. pumila* on shores in Scotland and Wales indicates that although present on shores of a variety of exposure to wave action the species nevertheless has a somewhat narrow tolerance range of water movement in terms of micro-environment. Thus, on very sheltered shores *D. pumila* usually occurs only on the middle to upper parts of fronds of fucoid algae, particularly *Ascophyllum nodosum* (L.) Le Jol., often the dominant alga on such shores; and then only in situations of maximal tidal flow, such as on the tops or sides of large rocks. On less sheltered shores *D. pumila* occurs lower down the algal fronds, evidently thus avoiding much of the wave action since it is there surrounded by the relatively huge algae – typically *Fucus serratus* L. on such shores. On shores sufficiently exposed that *F. serratus* is no longer entirely dominant on the mid-shore, but is replaced there in exposed micro-positions by barnacles, *D. pumila* occurs on the algae only near the bases of the stipes and is found also, still lower, on the rock itself. On very exposed shores – or parts of shores – where *F. serratus* is absent *D. pumila* occurs in still more sheltered micro-habitats, in crevices and beneath overhangs. Thus it seems that on sheltered shores *D. pumila* is found in micro-habitats having strong water movement, and on more exposed shores in situations where water-movement is least. This habitat 'preference' seems to be reflected also in the micro-distribution of the species on shores where a variety of exposure exists within a small area. More detailed study might show that the micro-distribution of this species can be correlated with biological wave-exposure scales of the kind postulated by Lewis (1964) and others. However, at present the influence of plankton- and silt-content of the water, and also of salinity, on the survival and growth of this species cannot be assessed. No doubt these and other factors than wave-exposure influence its micro-distribution; but at present it seems the correlation with wave-exposure is high.

Detailed habitat notes on the species in the Roscoff, NW France, area were provided by Prenant & Teissier (1924). Fowell (1944) recorded *D. pumila* as epizoic on the red coralline alga, *Corallina officinalis* L.

REMARKS. There seems little doubt that *Sertularia bursaria* Linnaeus, 1758, based on an earlier illustration of Ellis (1755) and later illustrated again by Ellis (1768, as *Cellularia*), is the present species. Bedot (1901 : 500) considered *bursaria* not to be a hydroid; but Ellis' illustrations leave no doubt. The specific name *pumila* Linnaeus, 1758, with which *bursaria* is here made a subjective synonym, is retained for the present species under the first reviser principle.

The nominal species *Dynamena distans* Lamouroux, 1816 : 180, appears not to differ from *D. pumila* (Linnaeus, 1758) and the two are here regarded conspecific. The first-mentioned should not be confused with *Sertularia distans* Lamouroux, 1816 : 191, which has been widely regarded as distinct (e.g. p. 296).

It was suggested by Winther (1879) and Kramp (1935) that *Sertularia gracilis* Hassall, 1848, and the present species are conspecific but following many authors (see p. 299) *S. gracilis* is here referred to *S. distans*.

A study of vegetative growth in *D. pumila* was made by Beloussov (1973).

Hydrallmania falcata (Linnaeus, 1758)

(Figs 15–16)

Corallina muscosa pennata ramulis & capillamentis falcatis. Ellis, 1755 : 12, pl. 7, figs A, a.
Sertularia falcata Linnaeus, 1758 : 810; Pallas, 1766 : 144–146 (syn. *S. stipulata* Linnaeus, 1758); Linnaeus, 1767 : 1309 (syn. *S. stipulata* Linnaeus, 1758).
Sertularia stipulata Linnaeus, 1758 : 813.
Serialaria falcata: Westendorp, 1843 : 34 (see Remarks).
Hydrallmania falcata: Hincks, 1868 : 273–275, pl. 58; Stechow, 1925 : 488, fig. 40; Vervoort, 1946 : 255–258, figs 111–113; Naumov, 1960 : 402–403, fig. 294; Naumov, 1969 : 433–435, fig. 294.

Further synonymy of this species was provided by Vervoort (1946).

TYPE MATERIAL AND LOCALITY. The two fragments preserved in the collections of the Linnean Society of London (Savage, 1945; numbered 1298.10) are both infertile. Since Linnaeus' original designation includes gonothecal characters ('*calycibus ovatis*') it seems unlikely that it was made from these fragments. As with several other Linnean hydroid species it seems probable that the designation was made from the illustration of Ellis (1755 : pl. 7, fig. A) which Linnaeus cited and which includes gonothecae. The illustrated specimen can, therefore, be regarded as holotype. It probably no longer exists (see notes under *Abietinaria abietina*, p. 251).

Ellis stated that the species was – as now – common off many British shores, mentioning by name only the coast at Sheerness, Isle of Sheppey, Kent. The type locality can thus be restricted to the coastal waters of N Kent.

MATERIAL EXAMINED. The BM(NH) collections include western European material from a wide variety of localities. The areas of origin and registered numbers of colonies having variant branches, shown in Fig. 16, are as follows: English Channel (1941.3.20.447; 1946.12.3.1; 1947.9.4.18; 1948.5.12.353; 1949.10.20.26); Irish coasts (1967.6.15.26, 43, 59, 79, 91, 107 & 151); W Scotland (1888.3.19.2) and Norway (1912.12.21.225; 1959.6.11.35; 1962.10.7.56; 1966.1.4.5). Details of the figured or measured specimens are as follows: Rongesund, Espegrend, nr Bergen, Norway, 25 m, 9 Apr 1962, colony in spirit + 1 microslide preparation, coll. W. J. Rees, 1962.10.7.56 (Fig. 15b). Port Erin, Isle of Man, 5 Oct 1894, two fertile hydrocladia on microslide, coll. E. T. Browne, 1961.11.4.61 (Fig. 15c). Kirkwall, Orkneys, Scotland, 2 Jul 1898, part of colony on microslide, coll. E. T. Browne, 1961.11.4.64 (Table 14). 'SW England', part of colony on microslide, coll. E. T. Browne, 1961.11.4.65 (Table 14). Reculver, Kent, strandline, Jul 1970, part of colony on microslide, coll. P. F. S. Cornelius, 1976.6.2.1 (Fig. 15a).

Description. Colony erect, tall, up to 640 mm recorded (Vervoort, 1946); main axis monosiphonic, in characteristic open spiral of pitch 10–30 mm, with lateral pinnate hydrocauli. Hydrothecae usually on one side of hydrocladia, but inclined alternately left and right; contiguous, in groups of 3–8 separated by nodal constrictions. Hydrothecae roughly tubular, broadening basally; aperture terminal, circular, even-rimmed; operculum circular, attached by inner edge. Some young colonies with alternate, biseriate hydrothecae (Fig. 15b) recalling arrangement in *Abietinaria* (see Variations, below). Hydranth 'minute and pure white' (Hincks, 1868), otherwise apparently undescribed. Gonotheca ♂ = ♀, ovoid to obpyriform, barely pedicellate; aperture terminal, broad, circular, sometimes (Naumov, 1969) with 4 internal 'denticles' (? = desmocytes). A colony 300 mm long had *c.* 4200 gonothecae (Vervoort, 1946).

Measurements. See Table 14.

Table 14 *Hydrallmania falcata.* Measurements in μm

	Holland (Vervoort, 1946)	Russian seas (Naumov, 1969)	Orkneys (1964.11.4.64)	SW England (1961.11.4.65)
Hydrotheca				
Length	400–600	400–600	380–500	380–520
Maximum width	130–150	130–150	120–160	150–180
Diameter of aperture		80–100	60–80	80–100
Gonotheca				
Length	1500	1000–1500		1200–1700
Maximum width		400–600		550–700
Diameter of aperture	250	230–300		210–240

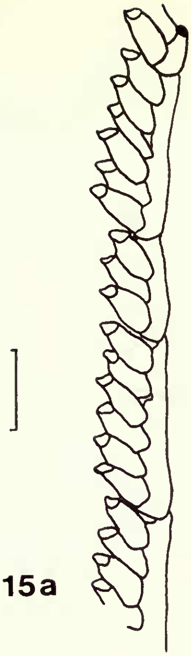
Variations. Young colonies and occasional branches of mature colonies have biseriate alternate hydrothecae, with two-cusped, not even, hydrothecal rims (Broch, 1918; Stechow, 1925; Vervoort, 1946; Naumov, 1969; Houvenaghel-Crèvecoeur, 1973). Mature colonies with occasional side-branches of this kind appear to occur sporadically within a population, and are not rare (Figs 15b, 16). They do not seem to deserve taxonomic recognition, and no name need be proposed for the variant. Although it resembles *Abietinaria* in many ways a phyletic relation with that genus should not be inferred automatically since the young stage of the rather different *Amphisbetia operculata* similarly resembles *Abietinaria* (see p. 255).

Reproductive season. Fertile specimens recorded March–May in NW France (Teissier, 1965), December–April in SW England (Marine Biological Association, 1957).

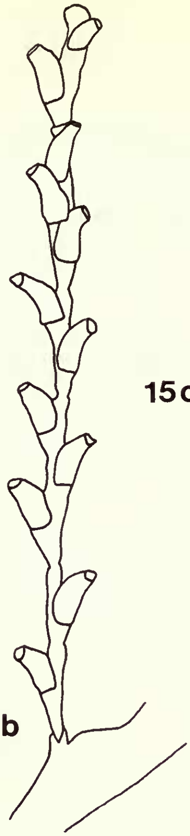
Distribution. Common throughout most of the present area in suitable places, being recorded from the Kattegat but not the Baltic (Stechow, 1927; Broch, 1928).

Habitat. Generally on sandy substrates, 20–100 m depth (Naumov, 1969). Detached colonies frequent on strand-line, sometimes occurring in large quantities.

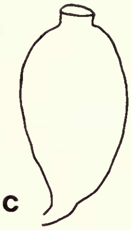
Figs 15–16 *Hydrallmania falcata.* **Fig. 15** (a) part of hydrocladium, lateral view, SE England (1976.6.2.1); (b) hydrocladium of abnormal but regularly observed growth form, W Norway (1962.10.7.56); (c) gonotheca, Isle of Man (1961.11.4.61); scale (a–c) = 500 μm. **Fig. 16** Localities of colonies in the BM(NH) collections with (solid circles) and without (open circles) abnormal hydrocladia. Four specimens having some abnormal hydrocladia had the imprecise locality 'Ireland' and are not represented on the map. See text for details of material (p. 273).



15a



15b



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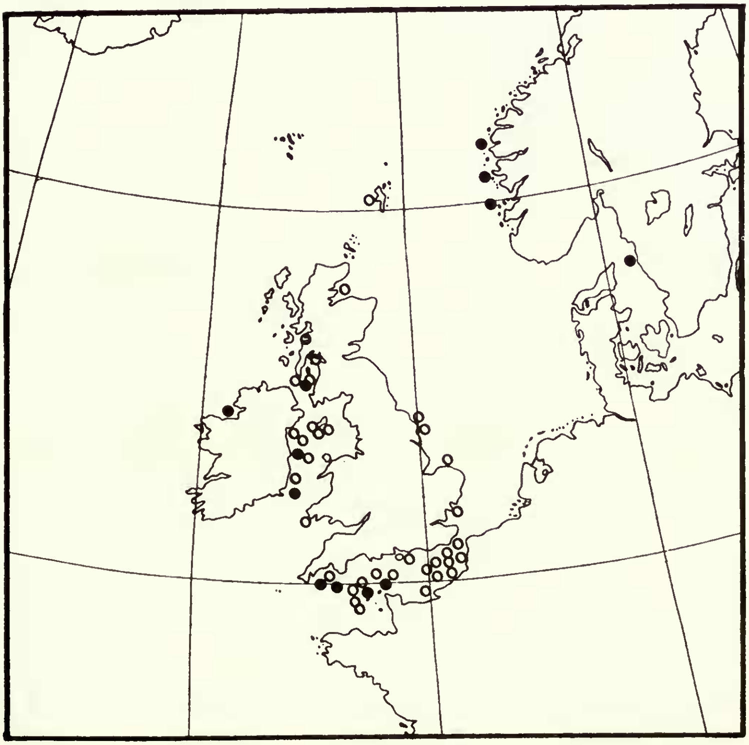

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REMARKS. *H. falcata* is a distinctive and widely recognized species frequently known as the sickle hydroid. A habit photograph was shown by Rees (1966 : ii). The significance of the interesting abnormal hydrocladia is treated under Variations, above. Settlement of the planula and early development has been described by Houvenaghel-Crèvecoeur (1973).

The Linnean species *Sertularia stipulata* was based on the illustration of Ellis (1755 : pl. 38, fig. 5 but not fig. 6) and is undoubtedly the present species. There is almost certainly no extant type material. Pallas (1766) acted as first reviser when using the species name *falcata* in preference to *stipulata*.

The genus *Serialaria* Lamarck, 1816, was introduced to accommodate four bryozoan species and its use for the present species by Westendorp (1843; see synonymy) was wrong. Thus *Serialaria* does not threaten the widely used genus name *Hydrallmania* Hincks, 1868. Bedot (1901) noted another incorrect use of the name *Serialaria* for a hydroid species.

Salacia articulata (Pallas, 1766)

(Fig. 17)

Corallina erecta pennata, denticulis alternis . . . Ellis, 1755 : 11–12, pl. 6, figs A, a.

Sertularia lichenastrum Linnaeus, 1758 : 813 (part); Linnaeus, 1767 : 1313 (part); (see Remarks).

Sertularia articulata Pallas, 1766 : 137 (binominal proposed for Corallina erect pennata . . . Ellis, 1755).

Sertularia lonchitis Ellis & Solander, 1786 : 42 (nom. nov. pro *S. lichenastrum* Linnaeus; see Remarks).

Thuiaria articulata: Fleming, 1828 : 565; Fleming, 1842 : 565; Hincks, 1868 : 277–279, pl. 60 (syn. *Sertularia lonchitis* Ellis & Solander); Naumov, 1960 : 408–410, fig. 296; Naumov, 1969 : 440–441, fig. 296.

Sertularia nigra: Johnston, 1838 : text-fig. 13 only (= holotype of *S. fusca* Johnston, 1847; see Other type material examined).

Sertularia fusca Johnston, 1847 : 70–71, fig. 6 (p. 57), fig. 11 (p. 70); Landsborough,1852 : 127–128; Alder, 1857 : 26–27; Hincks, 1868 : 272–273, pl. 50, fig. 2 (syn. *S. nigra:* Jameson; Johnston; Fleming; but not Pallas).

Thuiaria ellisii Busk, 1851 : 119 (see p. 280).

Selaginopsis fusca: Norman, 1878 : 191; Rees & Thursfield, 1965 : 152; (non *S. fusca:* Allman, 1876, = *S. allmani* Norman, 1878, by designation by Norman).

Thuiaria lonchitis: Nutting, 1904 : 66–67, pl. 9, figs 5–8; Vervoort, 1946 : 262–263, fig. 115b (syn. *T. kolaensis* Jaderholm, 1907); Calder, 1970 : 1538, pl. 8, fig. 5; Vervoort, 1972 : 186–187.

Abietinaria fusca: Levinsen, 1913 : 310–311; Broch, 1918 : 120–122 (syn. *Thuiaria salicornia* Allman, 1847*a*); Vervoort, 1946 : 242–243, fig. 106b (syn. *Sertularia nigra:* Jameson); Naumov, 1960 : 400–401, fig. 292; Naumov, 1969 : 431, fig. 292.

Thuiaria lichenastrum: Kudelin, 1914 : 282–284, figs 92, 93, 93a.

Dymella articulata: Stechow, 1923 : 8; Vervoort, 1946 : 265–266, fig. 116 (syn. *Sertularia lichenastrum* Linnaeus; *Thuiaria persocialis* Allman; *T. neglecta* Kirchenpauer; *T. personalis* Kirchenpauer; *T. pectinata* Campenhausen); Vervoort, 1972 : 186.

Thujaria articulara Williams, 1954 : 49 (lapsus pro *articulata*).

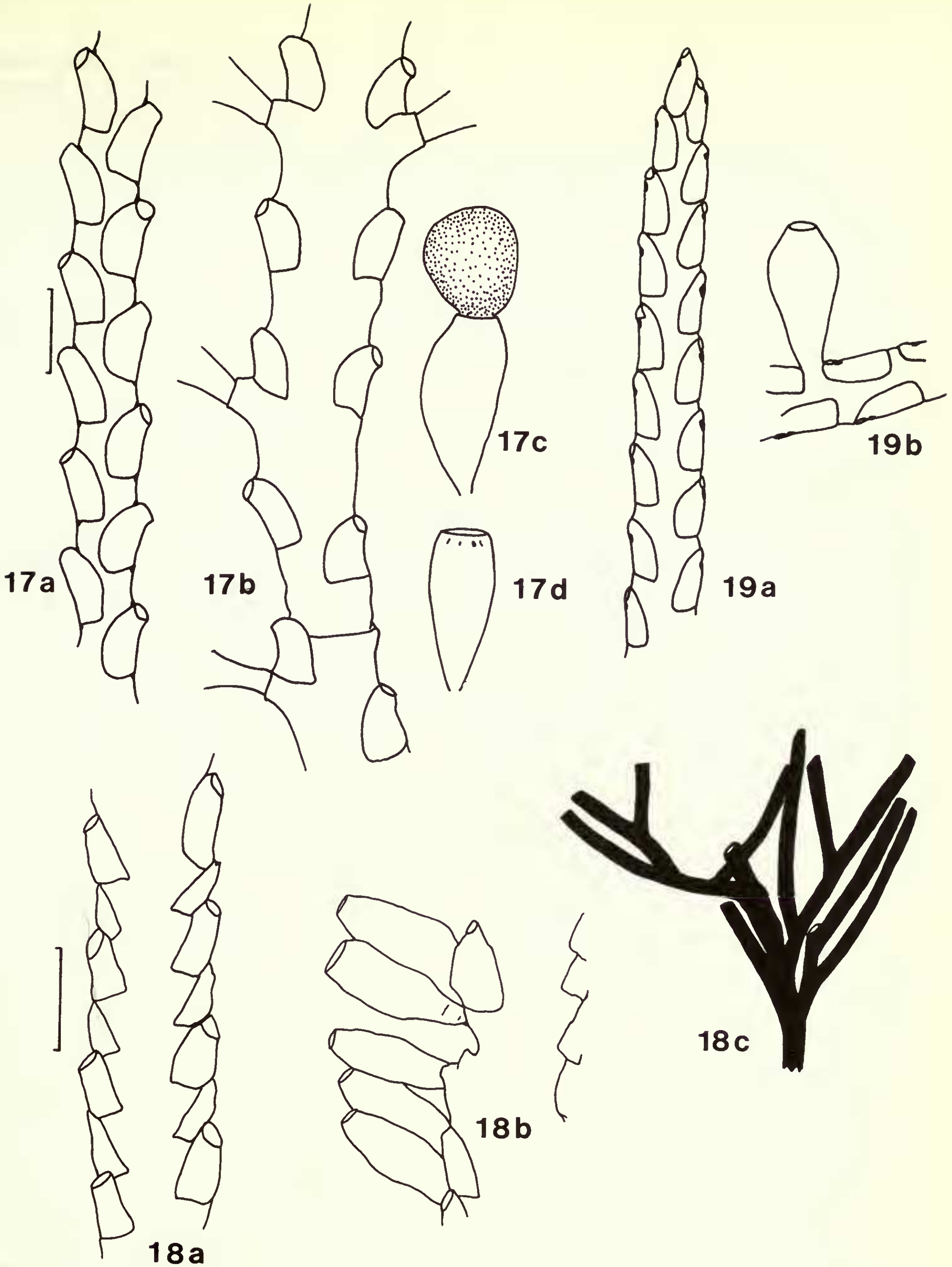
Salacia articulata: Millard, 1957 : 207 (syn. *Thuiaria persocialis* Allman; *T. pectinata* Allman); Rees & Thursfield, 1965 : 149 (syn. *Thuiaria pectinata* Allman); Millard, 1961 : 205 (syn. *Thuiaria ellisii* Busk).

Thuiaria barentsi Naumov, 1960 : 409–410, fig. 297, pl. 9, fig. 2; Naumov, 1969 : 442, fig. 297, pl. 9, fig. 2; (see Remarks).

? *Thuiaria uschakovi* Naumov, 1960 : 420–421, fig. 307, pl. 14, fig. 5; Naumov, 1969 : 452–453, fig. 307, pl. 14, fig. 5; (see Remarks).

TYPE MATERIAL AND LOCALITY. As explained in the Remarks section the original designation of *Sertularia articulata* Pallas, 1766, was based on plate 6 of Ellis (1755), drawn from a specimen from Dublin, Eire. It is virtually certain, however, that none of the hydroid specimens illustrated by Ellis (1755) survives (Cornelius, in prep.). The following series from the other side of the Irish Sea from Dublin is therefore designated neotype of *S. articulata* Pallas: off Lytham, Lancashire, England, 53° 44′ N, 2° 58′ W, several old colonies in spirit + 1 microslide (measured, Table 15), coll. R. L. Ascroft, 1893.2.28.13 (Figs 17a–b; Table 15).

OTHER TYPE MATERIAL EXAMINED. Lectotype of *Sertularia fusca* Johnston, 1847, single infertile colony comprising two pinnate hydrocauli, Dunstanburgh, Northumberland, deep water, coll.



Figs 17–19. **Fig. 17** *Salacia articulata*. (a) neotype, NE England, hydrocladium; (b) same, hydrocaulus; (c–d) gonothecae (?sex), W Scotland (1956.1.1.14); scale (a–d) = 500 μm. **Fig. 18** *S. lichenastrum*, syntype. (a) hydrocladium, scale = 500 μm; (b) same, gonothecae, scale as in (a); (c) silhouette of whole of syntype specimen on right of herbarium sheet (see note 14, p. 309), scale = 5 mm. **Fig. 19** *S. thuja*. (a) terminal region of hydrocladium, NE Scotland (1964.8.7.177); (b) gonotheca, NE England (1912.12.21.392); scale (a–b) as Fig. 17.

R. Embleton, 1847.9.22.24b (illustrated, Johnston, 1838: text-fig. 13, as *Sertularia nigra* Pallas, 1766; Johnston, 1847: text-fig. 6, as *S. fusca;* mentioned Gray, 1848 : 75, no. 26a). This specimen is the only one of the type series of *S. fusca* which could be located and is designated lectotype. It appears conspecific with the neotype material of *Sertularia articulata* Pallas, described above. Epizoic on it is a syntype specimen of *S. fallax* Johnston, 1847, regd no. 1847.9.22.24a; (see p. 261).

OTHER MATERIAL EXAMINED. Of the several dozen spirit and herbarium specimens from British localities in the BM(NH) collections, only material that has been measured, illustrated or specially mentioned here will be listed. Off Faroes, 61° 49′ N, 5° 36′ W, 160 m, 25 Aug 1906, part of colony on microslide, coll. m.v. 'Goldseeker', 1964.8.7.173 (Table 15; mentioned, Ritchie, 1911: 217, as *Thuiaria lonchitis;* Rees & Thursfield, 1965 : 150, as *Salacia lonchitis*). Off Washbourne, Cumbrae, Buteshire, Scotland, 15–30 m, 18 May 1955, many colonies in spirit + 1 microslide preparation showing acrocysts (? ♀), coll. W. J. Rees, 1956.1.1.14 (Fig. 17c–d; Table 15) (? first record of acrocysts in this species).

Apart from the lectotype there is apparently almost no material labelled *Sertularia fusca* Johnston in the BM(NH) collection. The only three specimens labelled as this species are referrable to *Salacia articulata* (Pallas) (1922.6.23.1, Aberdeen, 1792; 1912.12.21.306–307, both off Durham, 1875).

DESCRIPTION. Colony erect, up to 250 mm (Hincks, 1868), pinnate, rigid, hydrocaulus flat and wide, hydrocladia alternate (sometimes opposite), inserted on small processes, angle with main stem 70–80°; no second order branching. End of main stem spiral in some long colonies (Broch, 1918). Hydrothecae in two rows, alternate, those in each row successively pointing left and right, tubular, tapered, turned sharply outwards below aperture, with flat base and angular bottom corner in lateral view; aperture flush to slightly projecting, rim circular, slight characteristic thickening on proximal side visible in optical section; operculum circular, abcauline. Lateral distance between hydrothecae variable, usually widest on hydrocaulus. Gonothecae ? ♂ = ♀, in one or two rows, on upper sides of hydrocladia, cylindrical, often with asymmetric bulge on one side, sharply tapering basally; aperture circular, nearly as wide as widest part of gonotheca, some internal cusps near rim (? desmocytes), pedicel short; acrocyst (? ♀) present in some BM(NH) material (1956.1.1.14; Fig. 17c).

MEASUREMENTS. See Table 15.

Table 15 *Salacia articulata*. Measurements in μm

	Neotype	North Sea (1964.8.7.173)	? North Sea (Vervoort, 1946)	U.S.S.R. (Naumov, 1969)	W Scotland (1956.1.1.14)
Hydrotheca					
Length	420–490	400–500	400–600		435–470
Diameter	220–300	150–160	150–250		180–210
Diameter of aperture	100–130	90–110		110	120–150
Diameter of base	120–180	100–120			110–120
Gonotheca					
Length			1500–3000	1100	1100–1200
Maximum diameter			800–1500	400	400–520
Diameter of aperture				200	400–470

VARIATIONS. Although the hydrocladia are usually inserted alternately, specimens in which some are opposite occur (e.g. BM(NH) 1842.12.7.16). The hydrothecal apertures may be flush with the hydrocladial perisarc or – as in the measured neotype microslide preparation – the proximal margin may be slightly raised and not parallel with the hydrocladial axis. Some gonothecae have an asymmetric bulge (Naumov, 1969 : fig. 269). Density of perisarc pigment varies between colonies, possibly with age. The vertical distance between hydrothecae varies but is usually roughly equivalent to one aperture diameter.

REPRODUCTIVE SEASON. March–April near Roscoff at 80 m depth (Teissier, 1965); empty gonothecae with acrocysts still attached collected by W. J. Rees, 18 May 1955, Cumbrae, Buteshire, W Scotland (1956.1.1.14) (see Fig. 17).

DISTRIBUTION. Arctic to northern boreal, circumpolar. Although reported widely from the present area records south of a line from Dublin to London are relatively few, and are from deeper waters. There are southerly records from Roscoff (Teissier, 1965), Cornwall and Devon (Hincks, 1868; Marine Biological Association, 1957), the Isle of Man [Bruce *et al.*, 1963, including an undated record probably about 1960 (A. A. Fincham, pers. comm.)], Swedish, Danish and Dutch coasts (Jägerskiöld, 1971; Kramp, 1935; Vervoort, 1946) but not Belgium (Leloup, 1952). In the BM(NH) collections there are specimens from many localities in Scotland, and a few from Northumberland, Durham, Cumberland and Lancashire. South of the present area Castric-Fey (1973) recorded the species at 30 m depth off the north-west coast of France.

HABITAT. Naumov (1969) recorded a depth range of 18–300 m in Russian seas, with more usual limits of 50–200 m. Hincks (1868) stated the usual substrates to be stones and shells.

REMARKS. Reasons for adopting the generic name *Salacia* Lamouroux, 1816, in place of the more widely used *Thuiaria* Fleming, 1828, were summarized by Cornelius (1975*b*).

For more than two centuries there has been nomenclatural confusion between the present species, the older of its synonyms and *Sertularia lichenastrum* Linnaeus (1758 : 813). The original diagnosis of *S. lichenastrum* was based partly on material pieces of which are currently in the collections of the Linnean Society of London.[14] Linnaeus mistakenly identified with the material plate 10 of Ellis (1755). Pallas (1766 : 138, 139) realized this confusion and, while recognizing *S. lichenastrum* Linnaeus, 1758, provided the new name *S. articulata* for the specimen depicted by Ellis. Linnaeus (1767 : 1313) later perpetuated his original error in recognizing only one species, regarding as conspecific both *S. lichenastrum* sensu Pallas (= *sensu* Linnaeus, 1758) and the specimen illustrated by Ellis. Subsequently, Ellis & Solander (1786 : 42) provided the new name *Sertularia lonchitis* in place of *S. lichenastrum* sensu Linnaeus, 1767, including Ellis' (1755) plate in the synonymy. It seems plausible that Ellis & Solander were unaware of Linnaeus' error and that they intended merely to attach a binomen of their own choice to the species which Ellis had been first to describe and illustrate. Thus it seems that the names *S. articulata* Pallas, 1766, and *S. lonchitis* Ellis & Solander, 1786, should be regarded as objective synonyms, both having been provided as names for the material illustrated by Ellis (1755). Although Hincks (1868) followed Pallas in recognizing only one species, some subsequent authors have discussed whether or not there are nevertheless two species involved (Nutting, 1904; Kudelin, 1914; Naumov, 1960, 1969; Rees & Thursfield, 1965; Vervoort, 1972). Naumov recognized only one species. Vervoort (1972) also inclined to this view but considered Stechow's (1923) assertion that *S. articulata* (auct.) lacked an abcauline caecum as sufficient reason to maintain a separation from *S. lonchitis* (auct.). If in reality there are two species then a new name will have to be provided for that hitherto called *S. lonchitis* (auct.). A caecum appears to be present in some British material with contracted hydranths (1955.11.15.7; 1956.1.1.14), but Mammen (1965) doubted the value of the presence or absence of a caecum in contracted hydranths as a systematic character and suggested that it is simply a fold in the hydrothecal wall which appears when the hydranth contracts. Millard (1975), however, has put forward a strong case that it can be used as a generic character; and implied (op. cit., p. 231) that it might be present in some species of the genus *Synthecium* Allman, 1872, and not in others (see also p. 247, above). It certainly seems improbable that the two nominal species of *Salacia* being discussed should differ solely in the presence or absence of a caecum, however formed, and as suggested by Pallas (1766) it appears that only one species need be recognized.

The lectotype specimen of *Sertularia fusca* Johnston, 1847, was found to be referrable to the present species. It seems that definitions of the two species have been centred on specimens in which the hydrothecae are closely packed (*articulata*) or vertically separated (*fusca*), but these extremes are connected by intermediates and the two taxa appear conspecific. Further indication that this view might be correct is that the supposed geographical range of *S. fusca* is a small area within that of *Salacia articulata*, being approximately northern England to southern Iceland and the European mainland coasts of similar latitudes (Kramp, 1929).

Thuiaria ellisii Busk, 1851, was referred to the present species by Bedot (1910), and also by Millard (1961) who examined the type material.

Thuiaria barentsi Naumov, 1960, seems identical with the present species. The features on which it was designated – large desmocytes inside the gonothecal aperture and completely sunken hydrothecae – are shared by some specimens of the present species. In fact some of the hydrothecae on a 'paratype' fragment of *T. barentsi* in the BM(NH) collection (1962.10.10.21, White Sea, 87 m, one hydrocladium in spirit, pres. D. V. Naumov) project beyond the hydrocladium and cannot be described as wholly sunken.

Thuiaria uschakovi Naumov, 1960, held to differ from *T. barentsi* in having alternately arranged hydrothecae and narrower stems and branches, similarly seems referable to *Salacia articulata* which also has alternate hydrothecae; but I have not seen specimens.

Acrocysts, possibly ♀, are present in some of the material examined here (see Description, Other material examined and Fig. 17c). They seem previously unrecorded in the present species.

Salacia thuja (Linnaeus, 1758)

(Fig. 19)

Corallina vesiculata, caule angulato rigido. Ellis, 1755 : 10–11, pl. 5, figs b, B.
Sertularia thuja Linnaeus, 1758 : 809.
Sertularia thuya: Lamouroux, 1816 : 193 (unjustified emendation).
Thuiaria thuia: Fleming, 1828 : 545; Fleming, 1842 : 545 (unjustified emendations).
Thuiaria thuja: Hincks, 1868 : 275–277, pl. 59; Nutting, 1904 : 62–63, pl. 7, figs 1–3; Kudelin, 1914 : 293–303, figs 97–98; Fraser, 1944 : 309–310, pl. 65, fig. 297; Vervoort, 1946 : 259–262, figs 114b, 115a; Naumov, 1960 : 417–419, fig. 305; Naumov, 1969 : 450–451, fig. 305; Calder, 1970 : 1538, pl. 8, fig. 6; Vervoort, 1972 : 185–186.
Thujaria thuja: Broch, 1918 : 139–141; Hamond, 1957 : 318.
Salacia thuja: Stechow, 1923 : 214; Rees & Thursfield, 1965 : 151; Robins, 1969 : 333.

TYPE LOCALITY AND MATERIAL. There is apparently no material of this species in the Linnaeus collection at the Linnean Society of London (Savage, 1945). Linnaeus (1758) gave the 'habitat' as 'in Oceano', and did not provide a description after the diagnosis. Thus it seems that he based the diagnosis on previously published accounts and not on specimens (cf. note 14 on p. 309). It is likely that he used the illustrations of Ellis (1755 : pl. 5, figs b, B) which he cited, and the illustrated specimen can be regarded as the holotype. It almost certainly no longer exists (cf. note 14, p. 309), but it is not felt necessary at present to designate neotype material. Ellis knew the species from Scarborough and 'Scotland'. The status of the species in English waters is not clear, however (see Distribution, below), and the type locality is here restricted to Scottish waters.

MATERIAL. Only mentioned, illustrated or measured material is listed. Off Caithness coast, NE Scotland, 70 m, 15 Sept 1903, part of colony on microslide, coll. J. Ritchie, 1964.8.7.177 (Fig.19a; Table 16; mentioned, Rees & Thursfield, 1965 : 152). Durham coast, NE England, fertile colony in spirit and 1 microslide preparation, coll. A. M. Norman, 1912.12.21.392 (Fig. 19b; Table 16). Off Bell Rock (Inchcape Rock), Fife, Scotland, 30 Aug 1904, coll. J. Waterston, via J. Ritchie coll., young pinnate colony on microslide, 1964.8.7.177a (Table 16; mentioned, Ritchie, 1909b : 221). Several colonies in spirit, Bridlington Bay, Yorkshire, 7 Nov 1921, coll. s.s. 'George Bligh', 1956.2.2.5, 23–25. Infertile colony from strandline, Bridlington Bay, 28 May 1977, coll. P. F. S. Cornelius, 1977.6.1.1.

DESCRIPTION. Adult colony erect, up to *c.* 250 mm; in form of bottle brush, with branched hydrocladia arising all round stem. Main stem slightly flexuose, rigid, dark brown to black in older parts; lower branches deciduous on basal $\frac{2}{3}$–$\frac{3}{4}$ of stem. Young colonies alternate-pinnate; transition from pinnate to radial arrangement of hydrocladia apparently abrupt. Hydrocladial insertion close and radial in older colonies, hydrocladia dichotomously or less often alternately branched, ending in blunt points. Hydrothecae alternate, biseriate (rarely triseriate, BM(NH)

1964.8.7.177a; Ritchie, 1909*b*), cylindrical, entirely sunk, lateral circular aperture flush or nearly flush; circular one-flapped operculum attached on abcauline side. Distance between adjacent and successive hydrothecae variable. Naumov (1969) reported 'two rather distinct lateral denticles on the [aperture] margin' but these appear unusual. Adjacent side of hydrotheca convex, remote side straight to concave; length : breadth ratio from 2 : 1 to 5 : 1. Hydranth said (Leloup, 1952; Calder, 1970) to have abcauline diverticulum of enteron, but no BM(NH) material adequately preserved for this to be seen. Gonotheca ♂ = ♀, ovoid to inverted-conical, smooth (to rugose), tapering basally, no pedicel; widest just below aperture, which is circular, often on short collar; borne on hydrocladium below hydrotheca; Kudelin (1914) recorded ♀ acrocyst with one ovum in *S. thuja* 'subsp. *pacifica*' Kudelin.

MEASUREMENTS. See Table 16.

Table 16 *Salacia thuja*. Measurements in μm

	NE Scotland (1964.8.7.177)	NE Scotland† (1964.8.7.177a)	NE England (1912.12.21.392)
Distance between hydrocladial branches	1400–2000		
Hydrotheca			
Length	380–420	380–400	380–430
Maximum diameter	180–220	150–220	110–200
Diameter of aperture	90–100	90–110	60–80
Gonotheca (♂ = ♀)			
Length			830–1200
Maximum diameter			400–680
Aperture diameter			140–200

† Young (pinnate) colony with triseriate arrangement of hydrothecae (mentioned, Ritchie, 1909*b*).

VARIATIONS. Young colonies pinnate, older colonies having radially inserted hydrocladia which are branched dichotomously or alternately; hydrothecae alternate but variably spaced in all directions. Hydrothecal apertures flush to slightly prominent. See also Description.

REPRODUCTIVE SEASON. Apparently no data from boreal seas. Fertile material recorded May–October in N Russian seas (Kudelin, 1914), but no winter data available.

DISTRIBUTION. *Salacia thuja* has been recorded in European Continental Shelf waters from Portugal (Nobre, 1931) to the north of Scandinavia (74° 30′ N, 19° 03½′ E, 11 m; Kudelin, 1914). In the present area its distribution is patchy and seems to have contracted northwards during the past 100 years. Although present in the Kattegat it seems absent to the east of Copenhagen (Stechow, 1927; Broch, 1928; Kramp, 1935) and there are no recent records from the English Channel or the coasts of Belgium and Holland (Vervoort, 1946, 1949; Leloup, 1947, 1952; Marine Biological Association, 1957; Teissier, 1965; Robins, 1969). However, it has in the past been recorded from S Devon and Cornwall and the Dogger Bank (Hincks, 1868), the Scilly Isles (Clark, 1906), Sark (Ansted & Latham, 1862), Holland (pre 1766, Vervoort, 1946) and Belgium (Maitland, 1897). Ellis (1755) knew the species from only Scarborough on English coasts, and the only BM(NH) material from England in the present century is also from Yorkshire (see Material list). Hamond (1957) found occasional strand-line material from Norfolk in 1950 but his description of it suggests it might have drifted a long way. Possibly the present southern limit of the species in the southern North Sea is about 54° N.

On more westerly coasts there are no records from Wales, Lundy or the Isle of Man (Williams, 1954; Bruce *et al.*, 1963; Crothers, 1966; Hiscock, 1974 and pers. comm.; the late D. N. Huxtable, pers. comm.), although there is an undated record from Ilfracombe, N Devon (Cutcliffe, in Palmer, 1946) and old records from Londonderry in 1844, and Dublin, before 1878 (Stephens, 1905).

In Scottish waters the species is apparently less uncommon. The BM(NH) collection includes nineteenth-century herbarium material from Berwick Bay and the Firth of Tay; and Chumley (1918) recorded the species from the Clyde Sea, near which perhaps lies its present southern limit in W Scotland.

The apparent present British distribution of this species is difficult to explain since records from Portugal (Nobre, 1931) and the Mediterranean (Naumov, 1969; ? repeated by Christiansen, 1972) suggest that the species is tolerant of warmer sea temperatures than occur in southern England. However, the species was not recorded from the Adriatic by Riedl (1970) in a faunal survey and its presence in the Mediterranean should perhaps be regarded as unproven.

HABITAT. All depths to edge of Continental Shelf and slightly deeper. Naumov (1969) gave main depth limits of 50–200 m, with extremes of 2 and 800 m, in Russian seas. On shells and similar substrates (Johnston, 1847; Hincks, 1868).

REMARKS. No systematic revision of this distinctive species seems necessary. However, the similarity of *S. thuja* to *Thujaria laxa* Allman, 1874*a*, in all but colony shape is striking. Although *S. laxa* was recorded from 'as far south as the Shetlands' by Kramp (1943) he did not cite material and there are apparently no acceptable records from as far south as the British Isles. *S. laxa* has recently been redescribed by Naumov (1969), Calder (1970) and lastly Vervoort (1972), who placed it in the genus *Dymella* Stechow, 1923.

Sertularella gaudichaudi (Lamouroux, 1824)

(Fig. 20)

Sertularia gaudichaudi Lamouroux *et al.*, 1824 : 682 (but see addendum).

Sertularia fusiformis Hincks, 1861 : 253, pl. 6, figs 7–8.

Sertularella fusiformis: Hincks, 1868 : 234, 243, pl. 47, fig. 4, text-fig. 28; Hartlaub, 1901 : 85–86, text-fig. 55, pl. 5, figs 7–9 (syn. *S. simplex* Hutton, 1873); Ritchie, 1909c : 77–78, fig. 3; Bedot, 1912 : 353–354 (syn. *S. simplex* Hutton, 1873); Broch, 1918 : 105–106 (syn. *S. pellucida* Jaderholm, 1907); Millard, 1957 : 213–215, figs 10c–d (syn. *S. lineata* Stechow, 1923; non *S. fusiformis:* Warren, 1908); Millard, 1964 : 42–44 (syn. *S. ellisii* f. *ellisii* Picard, 1956).

Sertularella gaudichaudi: Billard, 1909 : 317–319, figs 5–6 [syn. *Sertularia picta* Meyen, 1834; *Sertularia exigua* (= *laxa*) Allman, 1888 (see Remarks); *Sertularella mediterranea* Hartlaub, 1901]; Billard, 1912 : 464–465 (syn. *S. mediterranea* auct.).

Sertularella ellisii: Picard, 1956 : 258–266, figs 1a, 2b, 3a–f.

Sertularella ellisii f. *fusiformis:* Teissier, 1965 : 23.

Sertularella mediterranea Hartlaub, 1901 : 10, fig. 6, 86–87, pl. 5, figs 10, 11, 15, 16; Broch, 1933 : 76–79; Vervoort, 1946 : 312–314; Vervoort, 1949 : 150–151, fig. 5; Hamond, 1957 : 316–317, fig. 24; Millard, 1957 : 215–216, figs 10e, 11b; Vervoort, 1959 : 272–273, figs 33a, 34a; Millard, 1964 : 45.

Sertularella polyzonias f. *mediterranea:* Leloup, 1952 : 168, fig. 97c; Picard, 1956 : 264, fig. 3b.

non *Sertularella ellisii* Deshayes & Edwards, 1836 = *S. polyzonias* (p. 290).

TYPE LOCALITY AND MATERIAL. The type material, now destroyed (Redier, 1967), was well described by Billard (1909). The type locality is the Falkland Isles (Billard, op. cit.). I have been unable to locate type material of either of the two main synonyms listed here (*S. fusiformis* Hincks, coasts of Devon; *S. mediterranea* Hartlaub, Rovinj, Yugoslavia), and in all probability none is extant. Professor Dr M. Dzwillo, Zoologisches Institut und Zoologisches Museum, Hamburg, informed me that no type material of the latter species is there although much of Hartlaub's collections survive. [The type material of *S. gaudichaudi* was described again by Billard (1922*b*).]

MATERIAL EXAMINED. This species is well represented in the BM(NH) collections, largely by material labelled *S. fusiformis* and *S. mediterranea*, and only measured and otherwise mentioned material is listed here. Burrafirth caves, Shetland Isles, Scotland, fertile hydrocladia on two microslides, coll. A. M. Norman, det. A. K. Totton, 1912.12.21.139A. 'Off Portugal' ('Porcupine' sta. 13), 1870, fertile fragments in spirit + 1 microslide preparation, coll. m.v. 'Porcupine', 1890.4.12.2–4 (Fig. 20a and Table 17). Naples, Italy, fertile colonies in spirit + 1 microslide preparation, coll. Stazione Zoologica, Naples, via. A. M. Norman, 1898.5.7.110 (Fig. 20b–c & Table 17).

DESCRIPTION. Hydrocauli erect, monosiphonic, flexuose, usually unbranched, up to 250 mm. Perisarc smooth to variably rugose; one hydrotheca per internode. Hydrothecae $\frac{1}{3}$–$\frac{1}{2}$ adnate, tubular to flask-shaped with sub-terminal constriction; walls smooth to rugose; aperture 4-cusped with 4-flapped operculum; 4 or fewer internal projections on wall near aperture, alternate in position with cusps on rim or in other positions (see Remarks); aperture usually perpendicular to hydrothecal axis but this variable. Gonotheca ovoid, length twice breadth, annulated throughout to smooth basally; aperture terminal, 3–4 cusped; ♀ said to be slightly larger than ♂. No acrocyst.

MEASUREMENTS. See Table 17.

Table 17 *Sertularella gaudichaudi*. Measurements in μm

	Portugal (1890.4.12.2–4)	Italy (1889.5.7.110)	S Africa (Millard, 1957, as *S. fusiformis*)
Hydrotheca			
Outer side	620–710	580–620	440–600
Inner side, length adnate	310–370	250–380	160–320
Inner side, length free	450–540	270–370	280–440
Diameter of aperture	200–250	160–190	200–250
Gonotheca (? ♂ = ♀)			
Length		1570–1650	1460–2160
Maximum diameter		740–800	780–990[†]

[†] Owing to a printer's error the maximum male gonothecal diameter was wrongly given as 1890 μm by Millard (1957 : 214). The correct figure was 890 μm. The maximum diameter of the female gonotheca was as stated, 990 μm (N. A. H. Millard, pers. comm.).

VARIATIONS. See Description and Remarks.

REPRODUCTIVE SEASON. Recorded fertile April–September in NW France (Teissier, 1965, as *S. mediterranea*).

DISTRIBUTION. Said to occur in warm and temperate Atlantic waters (Broch, 1918, as *S. fusiformis*). In the present area the species has been recorded as follows. As *S. fusiformis* – Clyde Sea (Ritchie, 1911; Chumley, 1918)[*], the Hebrides and N & S Devon (Hincks, 1868), NW France (Teissier, 1965), the Scilly Isles (Robins, 1969) and the Isle of Man (Bruce *et al.*, 1963). As *S. mediterranea* – Shetlands (present material), E Anglia, the Solent, Hebrides & Breton coast (Hamond, 1957), the Channel Isles (Philbert, 1935; Vervoort, 1949), NW France (Teissier, 1965) and Pembrokeshire (Crothers, 1966).

HABITAT. Recorded intertidally (Hincks, 1868, as *S. fusiformis*) and from shallow waters throughout the present area.

REMARKS. There seems little doubt from Billard's (1909, 1922b) accounts of the type material of *S. gaudichaudi* Lamouroux that *S. mediterranea* Hartlaub and *S. fusiformis* Hincks can be regarded its junior synonyms. However, other accounts have sought to distinguish the two last-mentioned taxa, and ignored the first. *Sertularella mediterranea* Hartlaub, 1901, was proposed to accommodate material from Rovinj, Yugoslavia, differing from *S. polyzonias* (Linnaeus, 1758) in having smaller hydrothecae, in possessing internal cusps near the hydrothecal aperture and in lacking acrocysts. Hartlaub regarded the absence of acrocysts even from mature material as the most diagnostic character. Although *S. mediterranea* has since been widely recognized, chiefly (Millard, 1957, 1964) on the arrangement of the internal hydrothecal cusps and orientation of the hydrothecal aperture, it nevertheless seems conspecific with *S. fusiformis* and *S. gaudichaudi*. The two characters seem variable both within *S. fusiformis* s. str. and according to published descriptions of *Sertularella mediterranea* (see synonymy).[15] Further, Vervoort (1946, 1966, 1972) has

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[*] also Rankin, 1901

shown internal cusps to be variable in number in material assigned to *S. mediterranea* and also in *S. leiocarpa* (Allman, 1888), *S. parvula* (Allman, 1888) and *Symplectoscyphus elongatus* (Jaderholm, 1904). It thus seems that *S. mediterranea* and *S. fusiformis* can be regarded conspecific, and placed in *S. gaudichaudi*. Some authors (Leloup, 1952; Picard, 1956; Naumov, 1960, 1969) have referred *S. mediterranea* to *S. polyzonias* Linneaus, 1758, but this view seems mistaken.

The nominal species *Sertularia exigua* Allman, 1888, was labelled *S. laxa* on the caption to the original illustration. Allman found it necessary to change the name to *exigua* after the plates had been printed but before the text had been completed (Allman, 1888 : caption to pl. 26). *Thuiaria laxa* Allman, 1874*a*, is a different nominal species (p. 282).

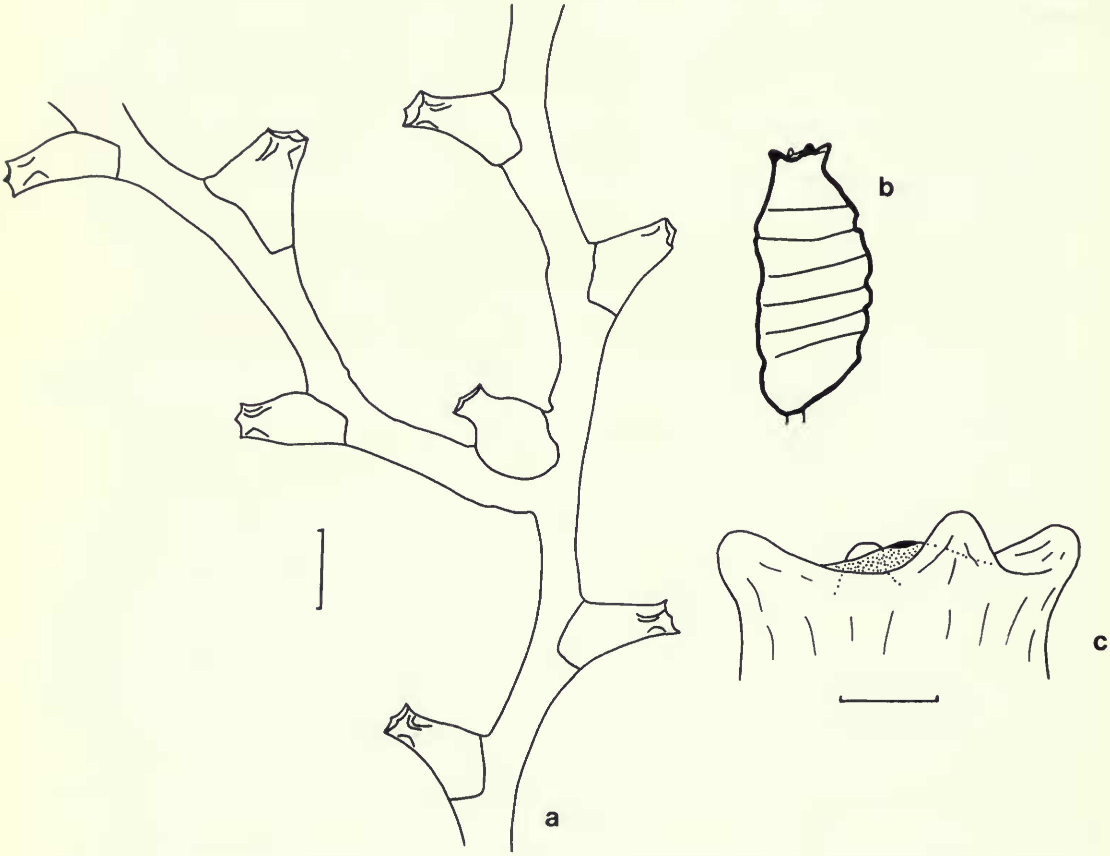


Fig. 20 *Sertularella gaudichaudi*. (a) part of colony, 'off Portugal' (1890.4.12.2–4), scale = 500 µm; (b) gonotheca, W Italy (1898.5.7.110), scale as in (a); (c) terminal region of (b), scale = 100 µm.

Sertularella gayi (Lamouroux, 1821)

(Fig. 21)

Sertularia gayi Lamouroux, 1821 : 12–13, pl. 66, figs 8–9; Lamouroux, Bory de Saint-Vincent & Deslongchamps, 1824 : 682; Deshayes & Edwards, 1836 : 152.
Sertularia pinnata Templeton, 1836 : 468.
Sertularella gayi: Hincks, 1868 : 237–239, pl. 46, fig. 2; Vervoort, 1959 : 273–275, figs 33b–c, 34b; Ralph, 1961 : 833–834, figs 24d–f; Vervoort, 1966 : 127–128, fig. 30; Vervoort, 1972 : 116–120, figs 36a–d.

TYPE LOCALITY AND MATERIAL. Coasts of English Channel (Lamouroux, 1821). If any type material was selected by Lamouroux it is almost certain that it was destroyed by a bomb at Caen on 7 July 1944, along with the bulk of the Lamouroux collection (Redier, 1967).

MATERIAL EXAMINED. Brattholmen, Hjeltefjord, Espegrend, nr Bergen, Norway, 40–90 m, 9 Apr 1962, two fertile colonies in spirit+1 microslide preparation, coll. W. J. Rees, 1962.10.7.27. Shetland, fertile fragments in spirit and on microslide, coll. A. M. Norman, 1912.12.21.324 (Fig. 21a, Table 18). Lousy Bank, 60° 20′ N, 12° 40′ W, 200–400 m, several colonies in spirit, coll. Ministry of Agriculture and Fisheries, 1921.5.17.1. Loch Buie, Isle of Mull, W Scotland, 20–30 m, fragment of fertile hydrocaulus on microslide, coll. J. Murray, 1888.12.21.3. Whitsand Bay, Cornwall, England, 40 m, Aug 1962, two hydrocauli with ♂ gonothecae on microslide, coll. R. C. Vernon, 1967.10.24.10. Plymouth, Devon, 10 Sep 1897, ♀ colony in spirit+1 microslide preparation showing acrocysts, coll. E. T. Browne, 1941.3.20.350 (Fig. 21b; Table 18). Mewstone Ledge, nr Plymouth, 20 m, several colonies in spirit, coll. R. Davis, 1962.8.8.1. 'Mountain Foot', Eire, 40–50 m, 24 Jul 1902, hydrocladia with ♀ acrocysts on 2 microslides, coll. E. T. Browne, 1967.6.15.86–87. Bay of Biscay, 800–850 m, two jars of spirit material+4 microslide preparations including ♂ & ♀ gonophores, coll. E. T. Browne, 1941.3.20.352–3 (Figs 21c–d; Table 18), 1961.11.4.3.

DESCRIPTION. Colony erect, up to *c.* 250 mm, main stem and main branches polysiphonic, arrangement of smaller branches pinnate to subpinnate with some second and third order branching. Hydrocladia flexuose to almost straight, perisarc smooth to slightly rugose, internodal constrictions diagonal. Hydrothecae alternate, flask-shaped, narrowing just below aperture which is usually at *c.* 90° to long axis of hydrotheca; rim 4-cusped, depth of intervening bays variable; operculum 4-flapped; $\frac{1}{3}$–$\frac{1}{2}$ adnate, free portion smooth to slightly rugose, outer side smooth. With axillary hydrothecae. Hydranth apparently undescribed. Gonothecae ♂ = ♀, ovoid to club-shaped, distal $\frac{1}{3}$–$\frac{2}{3}$ horizontally ridged to rugose, aperture terminal, 2–3 (rarely 4) cusps, more prominent than in *polyzonias* s. str.; if 2 then typically one larger than the other; dioecious; eggs retained after fertilization in acrocyst (hitherto undescribed; Fig. 21b) identical with that of *S. polyzonias* s. str.

MEASUREMENTS. See Table 18.

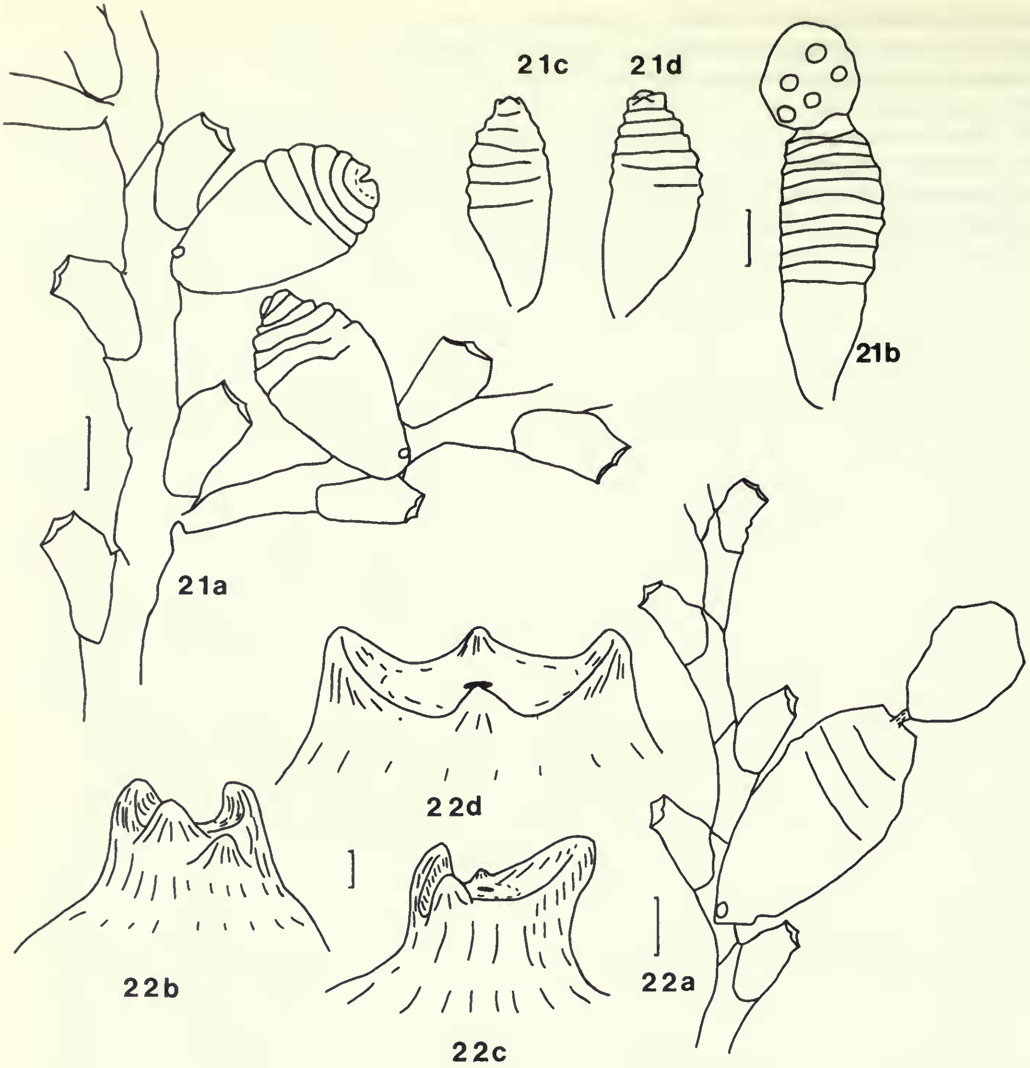
Table 18 *Sertularella gayi.* Measurements in μm

	SW England (1941.3.20.350)	Bay of Biscay (1941.3.20.353)	Shetland Isles (1912.12.21.324)
Hydrotheca			
Outer side	650–730	740–800	580–670
Inner side, length adnate	500–610	640–730	510–600
Inner side, length free	380–480	650–720	350–400
Diameter of aperture	300–370	200–280	320–350
Internode			
Length	980–1070	950–1080	800–920
♂ gonotheca			
Length		1900–2030	1550–1800†
Maximum diameter		780–860	730–810†
♀ gonotheca			
Length	2100–2400		
Maximum diameter	750–920		

† Sex uncertain.

VARIATION. Colony habit is usually erect and pinnate with polysiphonic main stem, but small colonies are barely recognizable as pinnate and are difficult to distinguish from colonies of *S. polyzonias* s. str. Distinctions between the two species are considered under Remarks.

The hydrothecae vary in the same way as do those of *S. polyzonias* (see p. 289). The gonothecal aperture has typically two opposite subequal rounded cusps (Fig. 21a) but in some specimens



Figs 21–22. Fig. 21 *Sertularella gayi.* (a) hydrocladia with gonothecae, N Scotland (1912.12.21.324), scale = 500 µm; (b–d) gonothecae, scale = 500 µm, (b) ♀ gonotheca with acrocyst, SW England (1941.3.20.350), (c) ♂ gonotheca with 3 cusps, Bay of Biscay (1941.3.20.353), (d) ♀ gonotheca with 4 cusps, Bay of Biscay (1941.3.20.352). Fig. 22 *S. polyzonias.* (a) hydrocladium and ♀ gonotheca with acrocyst and no terminal cusps, NE Ireland (1967.6.15.82), scale = 500 µm; (b–d) terminal regions of three gonothecae, scale = 100 µm, (b) 'abnormal', ♀, ? locality (1912.12.21.593), (c) 'abnormal', ♂, NE Ireland (1967.6.15.88), (d) 'normal', ? sex, NE Ireland (1967.6.15.83).

there are three, and in others two small pointed intermediate cusps between the main ones (Fig. 21d).

Reproductive season. Apparently no published information. Among the present material the following was fertile: 'Ireland', 27 Jul 1902 (1967.6.15.86); Bay of Biscay, Aug 1906 (1941.3.20.352–3); SW England, 10 Sep 1897 (1941.3.20.350).

Distribution. Widespread in North Atlantic coastal waters and common throughout the present area.

HABITAT. Recorded from all Continental Shelf depths. Similarities between this species and *S. polyzonias* make it unclear whether one species or both occurs intertidally.

REMARKS. Although the two nominal species *Sertularella polyzonias* and *S. gayi* have been recognized by several authors the recorded differences are few and apparently only three accounts have made a critical appraisal of them (Table 19). The main recorded differences, respectively, have been whether the colony is ramified and monosiphonic or pinnate and polysiphonic; whether the gonothecal aperture is 4- or only 2-cusped; and whether the free part of the adcauline hydrothecal wall is smooth or ridged. Many specimens show intermediate colony habits. Some small and ramified colonies have occasional polysiphonic stems and sometimes an incipient pinnate arrangement of the branches, and it is possible to arrange the colonies in a series so that those of the *polyzonias* type appear simply to be the younger specimens and *gayi* type colonies the older ones.

Table 19 Recorded differences between *Sertularella gayi* (Lamouroux, 1821) and *S. polyzonias* (Linnaeus, 1758)

Author	Characters ascribed to:	
	S. gayi	*S. polyzonias*
Hincks, 1868	Pinnate branching; gonothecal aperture 2-cusped	Irregular branching; gonothecal aperture 4-cusped
Picard, 1956	Pinnate branching; main stem and side-branches polysiphonic; gonethecal aperture with two unequal cusps	Irregular branching; main stem monosiphonic; gonothecal aperture 4-cusped
Millard, 1961	Free part of adcauline hydrothecal wall ridged; surface of gonotheca ridged distally, smooth basally	Free part of adcauline hydrothecal wall smooth; surface of gonotheca ridged throughout

The presence or absence of ridges on the free part of the adcauline hydrothecal wall is not correlated with either colony habit or gonothecal aperture cusps in the present material and seems unreliable as a specific character. The number and shape of the gonothecal aperture cusps were, however, loosely correlated with colony form, small ramified colonies having 2–4 pointed cusps and larger, pinnate colonies having 2–3 rounder cusps. However, the relation between the rounded and pointed cusps is not known and the two forms may nevertheless prove to be opposite ends of a series. The gonothecal 'contents' in large, pinnate colonies have not been previously described. The present material shows them be identical in both sexes with those of *S. polyzonias* s. str., an acrocyst being produced in the female (Fig. 21b).

Although the two species are very similar specific status is retained for each pending a fuller study of the characters on which they have been separated.

The original description of *Sertularia pinnata* Templeton, 1836, mentions thick main stems and pinnate branching. It thus seems referable to *S. gayi* s. str., and not to *S. polyzonias* s. str. as suggested by Johnston (1847) and Gray (1848). The combination *Sertularia pinnata* had previously been applied by Linnaeus (1758) and Pallas (1766) to other hydroid species (see p. 267).

Sertularella polyzonias (Linnaeus, 1758)

(Fig. 22)

Corallina minus ramosa alterna vice denticulata, . . . Ellis, 1755 : 5–6, pl. 2, figs A, B (part), pl. 38, fig. 1A.

Sertularia polyzonias Linnaeus, 1758 : 813 (part); Lamouroux, Bory de Saint-Vincent & Deslongchamps, 1824 : 681 (syn. *S. ericoides* Pallas); Johnston, 1847 : 61–63, pl. 10, figs 1–3 (syn. *S. flexuosa* Linnaeus, *S. ericoides* Pallas, *S. gayi* Lamouroux, 1821, *S. pinnata* Templeton[16], *S. hibernica* Johnston, 1838, *S. ellisii* Deshayes & Edwards).

Sertularia flexuosa Linnaeus, 1758 : 814.
Sertularia ericoides Pallas, 1766 : 127–128 (nom. nov. pro *S. polyzonias* Linnaeus and *S. flexuosa* Linnaeus).
? *Sertularia gayi* Lamouroux, 1821 : 12–13, pl. 66, figs 8–9 (see p. 287).
Sertularia ellisii Deshayes & Edwards, 1836 : 142–143.
Sertularella polyzonias: Gray, 1848 : 68–69 (syn. *Sertularia flexuosa* Linnaeus, *S. ericoides* Pallas, *Sertolara polizonia* Cavolini, 1785, *Sertularia gayi* Lamouroux, *S. pinnata* Templeton[16], *S. hibernica* Johnston, 1838, *S. ellisii* Deshayes & Edwards); Hincks, 1868 : 235–237, pl. 46, fig. 1 (syn. *Sertularia flexuosa* Linnaeus, *S. ericoides* Pallas, *S. pinnata* Templeton[16], *S. hibernica* Johnston, 1838, *S. ellisii* Deshayes & Edwards); Vervoort, 1946 : 224–226, fig. 96 (syn. *Sertularia flexuosa* Linnaeus, *S. ericoides* Pallas, *S. ciliata* Fabricius, 1780, *S. ellisii* Deshayes & Edwards, *S. hibernica* Johnston, 1838, *S. gigantea* Mereschkowsky, 1878, *S. quadricornuta* Hincks, 1880, *S. implexa* Hartlaub, 1901).

TYPE MATERIAL AND LOCALITY. Since Linnaeus' diagnosis of this species was not accompanied by a description and collecting data it is almost certain that he based the diagnosis on the illustrations of Ellis (1755 : pl. 2, figs A, B) which he cited (cf. note 13, p. 309).

It follows that material preserved on four herbarium sheets, numbered 1298.21–24 (Savage, 1945), in the collections of the Linnean Society of London was not used by Linnaeus when diagnosing the species and cannot be considered the type series. Probably the material reached Linnaeus after 1758 (see note 14, p. 309).

Herbarium sheet 1298.21 bears five colonies of the species here called *Symplectosyphus tricuspidatus;* sheet 1298.22 bears three infertile specimens of *Sertularella polyzonias*; sheet 1298.23 bears a fertile specimen of *S. polyzonias* without substrate, and an infertile specimen on a brown alga; and sheet 1298.24 bears a single, pinnately branched specimen of *S. polyzonias*. The three infertile specimens on sheet 1298.22 are here designated neotypes of *Sertularia polyzonias* Linnaeus, 1758.

Linnaeus stated the 'habitat' of this species to be 'in Oceano'. Ellis (1755) saw specimens of this species from the Isle of Sheppey and accordingly the type locality is here restricted to the north coast of Kent, England.

OTHER MATERIAL EXAMINED. Although the material listed had the characters of the present species as here defined, attention is drawn to the similarity of *S. gayi* (see Remarks). SW of Flattevossen, Espegrend, nr Bergen, Norway, 30 m, 9 Aug 1962, part of fertile colony on microslide, coll. W. J. Rees, 1962.11.7.39. Vattlestraumen, Espegrend, nr Bergen, Norway, 30–40 m, 15 Aug 1962, part of ♂ hydrocaulus on microslide, coll. W. J. Rees, 1962.11.7.13. Vattenholmen, Kosterfjord, Sweden, 80–120 m, 28 Sep 1964, parts of ♂ hydrocladia on microslides, coll. W. J. Rees, 1965.1.14.147–148. Löken, Gåsö Ränna, Gullmarsfjord, Sweden, 25–30 m, 13 May 1959, fertile fragment on microslide, coll. W. J. Rees, 1959.6.11.31. N end of Loch Sween, Argyll, Scotland, 1 m, 30 Jun 1962, hydrocaulus with gonothecae and terminal tendril, coll. W. J. Rees, 1962.6.19.14. Caol Scotnish, Loch Sween, Argyll, 1 m, 30 May 1962, fertile fragment on microslide, coll. W. J. Rees, 1962.6.19.20. 1·6 km E of Old Harry Rocks, Dorset, England, 20 m, several ♀ colonies on *Flustra* sp. (Bryozoa) in spirit + 1 microslide preparation, coll. R. Kirkpatrick, 1897.8.9.19 (Table 20). Weymouth Bay, Dorset, 20 m, hydrocaulus with ♂ gonothecae on microslide, coll. R. Kirkpatrick, 1897.8.9.20 (Table 20). Mewstone Ledge, Plymouth, Devon, 20 m, several colonies and fragments on microslide with ♀ gonotheca, coll. R. Davis, 1962.8.8.1. 'Mountain Foot', nr Leestone Point, Co Down, N Ireland, 40–50 m, 24 Jul 1902, fragments on 3 microslides, coll. E. T. Browne, 1967.6.15.82 (Fig. 22a), 83 (Fig. 22d), 88 (Fig. 22c). Off Clogher Head, Co Kerry, Eire, coll. E. T. Browne, fragments on 4 microslides as follows: 1947.12.1.3 (coll. 17 Jan 1902), 1967.6.15.148–150 (coll. 23 Jul 1902, 60–70 m). No locality, ♀ colony on microslide, ex A. M. Norman colln, 1912.12.21.593 (Fig. 22b).

DESCRIPTION. Colony monosiphonic, irregularly branched, ramified, often with second and third order branches; some branches terminating in tendrils which (Millard, 1957) may fuse with the stolon network. Hydrocauli slightly flexuose, perisarc smooth to slightly rugose; internodal constrictions diagnonal. Hydrothecae, alternate, one per internode, flask-shaped, narrowing just below aperture which is approximately at right-angles to long axis of hydrotheca; rim 4-cusped, depth of intervening bays variable, operculum 4-flapped; inner side of hydrotheca $\frac{1}{3}$–$\frac{2}{3}$ adnate, free part smooth to slightly rugose; outer side smooth. With axillary hydrothecae. Hydranth tentacles 20+ (Hincks, 1868). Gonothecae ♂ = ♀, ovoid to club-shaped, distal $\frac{1}{3}$–$\frac{2}{3}$ horizontally ridged to rugose, aperture terminal, 2–5 cusped (usually 4, frequently 3), cusps variable in shape and length; colonies dioecious. Eggs formed both on blastostyle and reportedly (Weismann, 1880) in hydrocauline coenosarc; ♀ acrocyst present.

MEASUREMENTS. See Table 20.

Table 20 *Sertularella polyzonias.* Measurements in μm

	SW England (1897.8.9.19)	SW England (1897.8.9.20)	S Africa (Millard, 1957)
Hydrotheca			
Outer side	550–600	530–600	450–590
Inner side, length adnate	370–430	400–430	270–380
Inner side, length free	350–410	320–360	270–350
Diameter of aperture	240–265	250–280	190–270
Internode			
Length	740–920	870–980	
♂ gonotheca			
Length		1780–2000	1570–1690
Maximum diameter		770–810	600–660
♀ gonotheca			
Length	1850–2000		2210–2230
Maximum diameter	750–850		920–930

VARIATIONS. The colony habit is usually ramified but some specimens show slight fusion of the hydrocauli which is more usual in *S. gayi* (p. 284). At present it is not clear whether the two species are distinct or whether the two colony types are simply opposite ends of a series of variation. Possibly colonies with a distinct polysiphonic stem are simply older specimens of the same species as the smaller, ramified colonies (see also Remarks under *S. gayi*, p. 287).

In colonies referrable to *S. polyzonias* s. str. there is some variation in hydrothecal characters. The aperture is typically at right angles to the long axis of the hydrotheca but it may slope slightly inwards or outwards. The adnate portion of the hydrotheca varies from $\frac{1}{3}$ to $\frac{2}{3}$. The free portion of the inner wall is usually smooth but is slightly rugose in some specimens. There is also variation in the gonothecal characters in both sexes. The length : breadth ratio of the gonotheca varies between colonies, while the condition of the cusps surrounding the aperture, on which systematic importance has been placed by some authors (e.g. Picard, 1956), varies strikingly both within and between colonies. In colonies here assigned to *S. polyzonias* s. str. on other characters the number of cusps varied between 2 and 4 (once 5), 4 being most usual and 3 frequent. The size of the cusps also varied (Fig. 22).

REPRODUCTIVE SEASON. Fertile material recorded July–August, Jersey (Vervoort, 1949), June–August, NW France (Teissier, 1965), August–September, SW England (Marine Biological Association, 1957).

DISTRIBUTION. Widespread in the North Atlantic and common in suitable localities over the whole of the present area.

HABITAT. Chiefly offshore to 50 m depth, less frequently down to 300 m (Naumov, 1969). Small colonies occur intertidally but (the late D. N. Huxtable, pers. comm.) probably remain infertile. Recorded substrates include rock, other hydroids and algae.

REMARKS. The female gonosome of *S. polyzonias* was described by Ellis (1755 : pl. 38, fig. 1A) and Hincks (1868) among others while that of the male seems to have been described only by Weismann (1883 : 165–168, pl. 6, fig. 5).

The relation between *Sertularella gayi* Lamouroux, 1821, and the present species is discussed under *S. gayi* (p. 287).

Sertularella polyzonias was considered to comprise two species by Deshayes & Edwards (1836) who provided the name *S. ellisii* for the new taxon. *S. ellisii* was distinguished on the basis of characters now known to be variable, viz. a flexuose hydrocaulus, fat hydrothecae, large hydrothecal apertures with 4 marginal cusps, and 4-cusped gonothecal apertures. Several authors (Johnston, 1847; Gray, 1848; Hincks, 1868; Vervoort, 1946) have regarded the two taxa as conspecific, and this view is adopted here. The material described under the name *S. ellisii* by Picard (1956) is referred here to *S. gaudichaudi* (p. 282).

The nominal species *Sertularia ericoides* Pallas, 1766, is discussed both here and under *Symplectoscyphus tricuspidatus* (p. 301). The view of Pallas (1766) that *S. polyzonias* Linnaeus, 1758, and *S. flexuosa* Linnaeus, 1758, are conspecific is followed here. Following Johnston (1847; but apparently not 1838), who appears to have been first reviser, the specific name *polyzonias* is employed. (Pallas had included both species in his *S. ericoides*.) *S. flexuosa* was based on a clear illustration of Ellis (1755), showing a female acrocyst among other details.

Sertularella rugosa (Linnaeus, 1758)

(Fig. 23)

Corallina exigua repens, denticulis alternis, fructus medicae cochleatae aemulis. Ellis, 1755 : 26–27, pl. 15, figs A, a.

Sertularia rugosa Linnaeus, 1758 : 809.

Sertularella rugosa: Hincks, 1868 : 241–242, pl. 47, figs 2, 2a–b; Hartlaub, 1901 : 121–124, pl. 6, fig. 12; Broch, 1918 : 106–107, fig. 57; Vervoort, 1946 : 226–228, fig. 97a; Yamada, 1950 : 13, pl. 1, fig. 12; Leloup, 1952 : 170–171, fig. 98; Naumov, 1960 : 340–341, fig. 230; Naumov, 1969 : 367–368, fig. 230.

Ellisia rugosa: Westendorp, 1843 : 22, pl. 1, figs g, h (see Remarks).

Type locality and material. Linnaeus (1758) gave the type locality as '*in Oceano*'. No Linnean material is extant in the collections of the Linnean Society of London (Savage, 1945) and it seems likely that Linnaeus made his designation solely from the illustration of Ellis (1755 : pl. 15, fig. A, but not fig. a) as no other reference was cited. The specimen illustrated by Ellis (A) can be regarded as the holotype. The illustration shows several gonothecae but no hydrothecae. Ellis stated he collected it from Brighton, Sussex, England, during June 1754, and the type locality can be restricted to Brighton. The specimen was not located and is probably no longer extant.

Material examined. Various localities around Espegrend, nr Bergen, Norway, 10–25 m, 31 Mar–13 Apr 1962, numerous colonies in spirit (4 jars) + 1 microslide preparation, coll. W. J. Rees, 1962.10.7.15, 36, 43, 67. Sneholm, Kosterfjord, Sweden, 40 m, 28 Sep 1964, small colony on *Flustra* sp. (Bryozoa), coll. W. J. Rees, 1965.1.14.175. Shetland, 1861, fertile fragment in spirit, coll. A. M. Norman, 1912.12.21.338. Cromarty harbour, NE Scotland, 18 m, 8 Mar 1907, two fragments on microslide, coll. J. Ritchie, 1964.8.7.143 (mentioned, Rees & Thursfield, 1965 : 138). Off Sanda I., Argyll, Scotland, 20–30 m, several colonies on *Flustra* sp., coll.R. B. Pike, 1955.11.15.12. Redcar, Yorkshire, England, 1907, fertile fragments on 2 microslides, coll. and det. J. Ritchie, 1964.8.7.144–145 (Table 21; mentioned, Rees & Thursfield, 1965 : 138). Bridlington Bay, Yorkshire, 7 Nov 1921, two fragments on microslide, coll. Ministry of Agriculture & Fisheries, 1956.2.2.8 (Fig. 23a & Table 21). Port Erin, Isle of Man, 1893, fertile fragment from *Flustra* colony on microslide, coll. & det. E. T. Browne, 1961.11.4.49 (Fig. 23b & Table 21). Hastings, Sussex, fragments on *Flustra* on microslide, coll. G. Busk, 1899.7.1.5834. Ilfracombe, Devon, 25 m, 31 May 1904, several colonies in spirit + 1 microslide preparation, coll. A. M. Norman, 1912.12.21.590 (Fig. 23c–d & Table 21).

Description. Colonies usually described as being of two forms, but these probably intergrade. The first comprises creeping stolons with irregularly spaced erect hydrocauli which are usually unbranched, up to 40 mm; the second has hydrothecae and gonothecae borne directly on the stolon. Hydrocaulus in erect specimens variably flexuose, hydrothecae alternate, one per internode. Hydrothecae short, $\frac{1}{4}$–$\frac{2}{3}$ adnate (Naumov, 1969); sides with typically 3–4 horizontal grooves, variable in depth, sometimes slight and on outer wall only, but usually much deeper and completely encircling hydrotheca; characteristic deep furrow below aperture on outer side (Broch, 1918; Naumov, 1969), aperture consequently inclined outwards; aperture operculate, 4-cusped. Hydranth inadequately described, but known to have a diverticulum [Leloup, 1952 : fig. 98 B1; BM(NH) material 1956.2.2.8, 1962.10.7.36]. Gonothecae ? ♂ = ♀, large, ovoid, variably furrowed, occasionally only distally; aperture terminal, 4 (or 3 long + 1 short)-spined. One poorly preserved ♀ specimen has structures which are possibly acrocysts [BM(NH) 1964.8.7.145].

Measurements. See Table 21.

Table 21 *Sertularella rugosa*. Measurements in μm

	Erect specimens		Stoloniferous specimens	
	NE England (1964.8.7.145)	NE England (1956.2.2.8)	SW England (1912.12.21.590)	Isle of Man (1961.11.4.49)
Hydrotheca				
Outer side	250–300	380–450	350–400	330–420
Inner side, length adnate	160–250	160–220		
Inner side, length free	260–390	380–450		
Diameter of aperture	180–220	190–240	180–220	200–220
Internode				
Length	370–440	280–380		
Gonotheca (? ♂ = ♀)				
Length	1100–1600†			1350–1850‡
Maximum diameter	950–1150†			850–1100‡
Maximum length of terminal spines	120			110

† ? ♀ from contents; ‡ ♂ from contents.

Variation. Hydrocauli of this species are variably flexuose. Depth of furrowing of hydrotheca and gonothecal walls varies from deep grooving to barely perceptible indentation (Fig. 23). The lateral subterminal notch below the hydrothecal aperture varies in depth so that the angle between aperture and hydrothecal axis varies within the approximate limits 30° and 70°. The portion of the inner hydrothecal wall which is adnate varies from $\frac{1}{4}$ to $\frac{2}{3}$.

Reproductive season. Fertile material recorded in April both off NW France and in Oslo Fjord (Teissier, 1965; Christiansen, 1972).

Distribution. Widely distributed in European coastal waters (Broch, 1918) and throughout the present area, including the Skagerrak, Oslo Fjord, Kattegat and the entrance to the Baltic (Stechow, 1927; Broch, 1928; Rees & Rowe, 1969; Christiansen, 1972; Rasmussen, 1973) but not the inner Baltic (Naumov, 1969; Christiansen, 1972).

Habitat. European specimens in the BM(NH) collection come from depths of 10–40 m. Naumov (1969) gives a normal depth range in Russian waters of 25–50 m with extreme limits of 0–263 m. The species has occasionally been recorded intertidally (Hincks, 1868; Broch, 1918). It commonly grows on *Flustra* spp. (Bryozoa), hydroids and brown algae (Hincks, 1868; Vervoort, 1946; Hamond, 1957); and has been recorded on lobster pots (Crothers, 1966). Hincks' statement that the species is commonly parasitic on *Flustra* almost certainly refers simply to substrate association.

Remarks. Differences from *S. tenella* are discussed under that species (p. 293). See also note 20, p. 309, for comments on *Ellisia* Westendorp, 1843.

Sertularella tenella (Alder, 1856)

(Fig. 24)

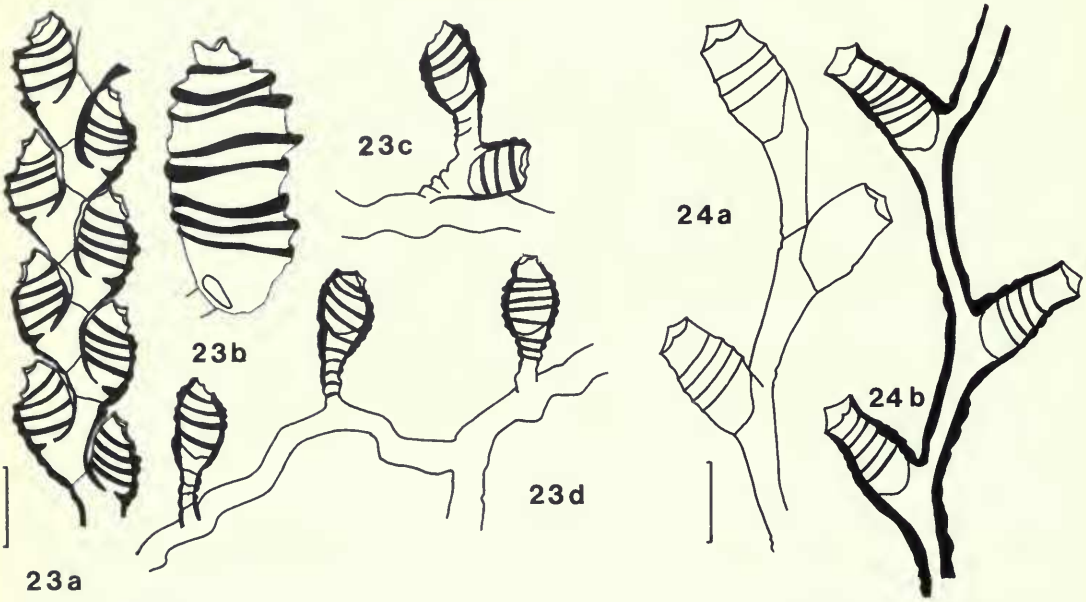
Sertularia rugosa var. Johnston, 1847 : 63.

Sertularia tenella Alder, 1856 : 357–358, pl. 13, figs 3–6; Alder, 1857 : 113–114, pl. 4, figs 3–6.

Sertularella tenella: Hincks, 1868 : 242–243, pl. 47, figs 3, 3a–c; Hartlaub, 1901 : 63–64, pl. 5, figs 21–23, pl. 6, figs 2, 4, 7, 9, 10 (syn. *S. geniculata* Hincks, 1874); Broch, 1918 : 104–105; Vervoort, 1946 : 228–229, fig. 97b; Yamada, 1950 : 12–13, pl. 1, fig. 11 (syn. *S. atlantica* Stechow); Naumov, 1960 : 341–342, fig. 231; Blanco, 1963 : 173–174 (syn. *S. geniculata* Hincks, *S. microgena* von Lendenfeld); Naumov, 1969 : 368–369, fig. 231; Calder, 1970 : 1529–1531, pl. 6, fig. 6.

Sertularella geniculata Hincks, 1874 : 152–153, pl. 7, figs 13–14.

Sertularella atlantica Stechow, 1920 : 21–22, fig. 2a; Stechow, 1923 : 183–184, fig. A^{1}a.



Figs 23–24. **Fig. 23** *Sertularella rugosa.* (a) part of erect hydrocaulus, NE England (1956.2.2.8); (b) gonotheca, Isle of Man (1961.11.4.49); (c–d) part of stoloniferous colony, including (c) short erect hydrocladium, SW England (1912.12.21.590); scale (a–d) = 500 µm. **Fig. 24** *S. tenella.* (a) tip of thin walled hydrocladium, W Norway (1962.11.7.40); (b) part of thick walled hydrocladium, W Scotland (1888.12.21.3a); scale (a–b) = 500 µm.

TYPE LOCALITY AND MATERIAL. No type locality was given by Alder but Cornelius & Garfath (in press) have recently restricted it to the coast of Northumberland, England. Syntype herbarium material is extant in the Hancock Museum, Newcastle upon Tyne (several colonies on *Abietinaria abietina*, preserved on a herbarium sheet) and in the British Museum (Natural History) (two dried hydrocauli, 1857.8.3.49) (Cornelius & Garfath).

OTHER MATERIAL EXAMINED. (All infertile.) Dodd Narrows, Vancouver Island, Canada, 30 m, several fragments in spirit, coll. Miss Pixell, 1919.9.19.14. N side of Vattlestraumen, Espegrend, nr Bergen, Norway, 15–25 m, 13 Apr 1962, hydrocaulus in spirit, coll. W. J. Rees, 1962.10.7.14. SW of Flattevossen, nr Espegrend, 30 m, 9 Aug 1962, hydrocaulus in spirit + 1 microslide preparation, coll. W. J. Rees, 1962.11.7.40 (Fig. 24a). SE of Lilla Sneholm, Kosterfjord, W. Sweden, 40 m, 28 Sep 1964, colony in spirit, coll. W. J. Rees, 1965.1.14.177. Vattenholmen, Kosterfjord, 80–120 m, 28 Sep 1964, fragments in spirit, coll. W. J. Rees, 1965.1.14.98. Vädero Is, W Sweden, 80 m, 1 Oct 1964, fragments in spirit, coll. W. J. Rees, 1965.1.14.122. Gåsö Ranna, Gullmarsfjord, W Sweden, 20–30 m, 27 Aug 1962, several colonies in spirit + 1 microslide preparation, coll. W. J.

Rees, 1962.11.8.16. Smorhullen, Gullmarsfjord, 50 m, 13 Oct 1964, several colonies in spirit, coll. W. J. Rees, 1965.1.14.170. Loch Buie, Mull, Argyll, Scotland, 20–30 m, fragments on microslide, coll. J. Murray, 1888.12.21.3a (Fig. 24b). Sound of Mull, 40–200 m, 1 Oct 1970, several colonies in spirit, coll. P. F. S. Cornelius, 1971.5.11.42–43. Off Millport, Gt Cumbrae I., Bute, 40 m, Sep 1970, several colonies in spirit, coll. C. Edwards, 1971.5.11.44. Off Durham, England, 40–70 m, Jul 1874, several colonies in spirit + 1 microslide preparation, coll. A. M. Norman, 1912.12.21.333. Off NW Africa, 34° 57′ N, 11° 52′ W, 1070 m, colony on lopheliid coral, coll. J. Y. Buchanan, 1884.3.14.7.

DESCRIPTION. Colonies usually comprising creeping stolons with irregularly spaced, erect, usually unbranched hydrocauli up to 20 mm, but hydrothecae sometimes borne directly on the stolon. Hydrocaulus in erect specimens variably flexuose. Hydrothecae alternate, one per internode; up to ¼ adnate; walls with 5–6 annulations, sometimes (Bennitt, 1922) slight and on outer wall only, or entirely absent; rim 4-cusped, at 90° to hydrothecal axis, lacking notch below rim on outer side. Gonothecae ?♂ = ♀, large, oval, rugose, terminal 3–4 spined aperture; similar to those of *S. rugosa* (see Remarks).

MEASUREMENTS. See Table 22.

Table 22 *Sertularella tenella.* Measurements in μm

	Russia (Naumov, 1969)	Canada (Calder, 1970)	Japan (Yamada, 1950)	W Europe (Vervoort, 1946)
Hydrotheca				
Outer side	500–540	660–790	450	500
Inner side, length adnate	140–230	310–350		
Inner side, length free	420–480	480–610		
Diameter of aperture	230–370	250–310	220	
Internode				
Length		1000–2100		
Gonotheca (?♂ = ♀)				
Length	2000 (max)			900–1000
Maximum diameter	1000			550

VARIATIONS. See Remarks.

REPRODUCTIVE SEASON. There is apparently no published information from European waters, and there are no fertile specimens in the BM(NH) collection.

DISTRIBUTION. Widely distributed in the eastern North Atlantic (Broch, 1918) and found sporadically throughout the present area including the Kattegat and Skagerrak (Stechow, 1927; Broch, 1928; Rees & Rowe, 1969) but not east of the entrance to the Baltic (Broch, 1928; Naumov, 1969).

HABITAT. European specimens in the BM(NH) collection come from 10–120 m depth-range. Naumov (1969) gave a normal depth-range of 25–150 m with extreme limits of 25–1000 m. Recorded growing on other hydroids (Hincks, 1868; Vervoort, 1946).

REMARKS. The characters on which the two nominal species *Sertularella rugosa* (Linnaeus, 1758) and *S. tenella* (Alder, 1856) have been separated are rather few (Table 23), and until they can be re-assessed it is perhaps best to regard the continued separation of the two taxa as provisional. The single feature by which BM(NH) specimens can be separated is the presence or absence of the notch below the rim on the outer wall of the hydrotheca as seen from the side (Figs 23, 24). The depth of this notch in *S. rugosa* is variable, as is the general rugosity of the perisarc in both species, and it may be that the notch has no systematic value.

Sertularella geniculata Hincks, 1874, described from Icelandic material, was referred to the present species by Hartlaub (1901), whose opinion is followed here.

Table 23 Previously recorded differences between the nominal species *Sertularella rugosa* (Linnaeus, 1758) and *S. tenella* (Alder, 1856) (after Alder, 1856, 1857; Hincks, 1868; Hartlaub, 1901; Kramp, 1935; Vervoort, 1946; Yamada, 1950; Naumov, 1960, 1969)

Sertularella rugosa	*Sertularella tenella*
Hydrothecal aperture inclined outwards with respect to axis of hydrotheca	Hydrothecal aperture not inclined outwards
Notch below rim of hydrotheca on outer side	No notch
Hydrotheca ¼–½ adnate	Hydrotheca ¼ adnate
3–4 annuli on hydrotheca	5–6 annuli on hydrotheca

Sertularia cupressina Linnaeus, 1758

(Fig. 25)

Corallina muscosa alterna vice denticulata, . . . Ellis, 1755 : 6–7, pl. 2, figs C, c.
Corallina Cupressi forma, denticulis obtusis, . . . Ellis, 1755 : 7, pl. 3, figs A, a.
Sertularia cupressina Linneaus, 1758 : 808 (binomen for Corallina Cupressi forma, . . . of Ellis); Pallas, 1766 : 141–144 (syn. *S. argentea* Linnaeus); Linnaeus, 1767 : 1308; Hincks, 1868 : 270–272, pl. 57; Winther, 1879 : 308–309, pl. 6, figs 17–20; Broch, 1918 : 124–126 (syn. *S. argentea* Linnaeus); Vervoort, 1946 : 243–249, figs 107, 108, 114a (syn. *S. argentea* Linnaeus; *S. dentata* Lamouroux, 1816; *S. splendens* Lamouroux, 1816; *S. uber* Dalyell, 1834); Hancock *et al.*, 1956 : 307–325, figs 1a–d, 2c; Naumov, 1960 : 361–362, fig. 252 (syn. *S. argentea* Linnaeus); Naumov, 1969 : 390–391, fig. 252 (syn. *S. argenta* Linnaeus); Vervoort, 1972 : 183 (syn. *S. argentea* Linneaus); Cornelius, 1975b : 405 [syn. *S. echinata* Linnaeus (part)]; Calder, 1975 : 309–310, fig. 5f.
Sertularia argentea Linnaeus, 1758 : 809; Linnaeus, 1767 : 1308; Hincks, 1868 : 268–270, pl. 56; Hancock *et al.*, 1956 : 307–325, figs 1e–m, 2a–b, d–e, 3a–j, 5a–f; Calder, 1975 : 308–309, fig. 5e.
Sertularia echinata Linnaeus, 1761 : 541 (part); Pallas, 1766 : 152 (part); Linnaeus, 1767 : 1310 (part).
? *Sertularia pinnata* Pallas, 1766 : 136–137 (part); (see p. 267).
? *Sertularia cupressina* var. *tenera:* Winther, 1879 : 309–311, pl. 6, figs 7–16 (see p. 301).
Sertularia argentella Pennington, 1885 : 117, pl. 8, figs 1, 1a.

NOMENCLATURE. Pallas (1766) acted as first reviser when regarding *S. cupressina* Linnaeus, 1758, and *S. argentea* Linnaeus, 1758, as conspecific, and his adoption of the name *cupressina* for the species is followed here.

TYPE MATERIAL AND LOCALITY. The original diagnoses of the two nominal species *Sertularia cupressina* Linnaeus, 1758, and *S. argentea* Linnaeus, 1758, were not accompanied by descriptions or collecting data. It is, therefore, probable that the diagnoses were made from previously published accounts rather than from specimens (cf. note 13, p. 309). It follows that the material of *S. cupressina* in the Linnean collection of the Linnean Society of London (Savage, 1945 : 206) cannot be regarded as the original type series, and that the specimens illustrated by Ellis (1755 : pl. 3, figs A, a), the sole work cited by Linnaeus (1758), can be regarded the type series of *S. cupressina.* (Linnaeus cited several works under *S. argentea.*) It is virtually certain, however, that almost no Ellis hydroid material remains (Cornelius, in prep.), and that the original type series of *S. cupressina* is lost.

The Linnean Society of London collection contains (Savage, 1945) two herbarium sheets of hydroid material labelled *Sertularia cupressina.* For the reasons outlined above it seems Linnaeus received them after diagnosing this species, but nevertheless later identified them with it. Savage numbered the two sheets 1298.5–6. The first sheet bears a much branched infertile colony comprising four main hydrocauli *c.* 200 mm long, each with many side branches. The second bears a single *c.* 300 mm specimen forked near the tip, with many side branches. The specimen on sheet 1298.5 is here designated neotype of *Sertularia cupressina* Linnaeus. It is likely that the specimen came from Ellis (cf. Cornelius, 1975*a* : 273, footnote), and it seems appropriate to restrict the type locality of *S. cupressina* to the coasts of England, from whence Ellis obtained specimens. There is no material labelled *S. argentea* in the Linnean collection and no type material of that nominal species is identified here.

OTHER MATERIAL EXAMINED. *Sertularia cupressina* is exceptionally well represented in the BM(NH) collections and only measured, illustrated or otherwise mentioned specimens are listed. North Sound, Orkney, Scotland, 44 m, 13 Jul 1907, fertile fragments on microslide, coll. J. Ritchie, 1964.8.7.160 (mentioned, Rees & Thursfield, 1965 : 146, as *S. argenta*). Isle of Man, 10 Sep 1894, colony on microslide, coll. E. T. Browne, 1961.11.4.78 (Table 24). Various localities off south Devon, England, 4 microslide preparations of parts of colonies, coll. E. T. Browne, 1961.11.4.74, 77 (Table 24), 79. Hastings, Sussex, colony on microslide, coll. G. Busk, 1899.7.1.6134. Off Leigh, Essex, parts of colonies on 9 microslides, coll. F. J. Lambert, 1927.7.7.10 (Fig. 25; Table 24).

DESCRIPTION. Colonies erect, monosiphonic, long, with short side branches arranged spirally or (particularly in young specimens) in one plane; side branches themselves branched, dichotomously or alternately. Hydrothecae in sub-opposite to sub-alternate pairs, cylindrical basally, tapered distally and variably out-turned, outer wall straight to concave; inner side $\frac{1}{3}$–$\frac{2}{3}$ adnate; rim 2-cusped, cusps equal or outer longer, this varying along a hydrocaulus (longest cusps on oldest hydrothecae); frail 2-flapped operculum. Axillary hydrothecae present. Hydranth very extensile, *c.* 20 tentacles (Hincks, 1868). Gonotheca ♂ = ♀, changing shape during development; club-shaped when young, fully developed ones widest $\frac{2}{3}$–$\frac{3}{4}$ from base, with 1–2 opposite pairs of distal lateral horns usually developing later although (Broch, 1918) hornless mature gonothecae occur; aperture terminal, circular, on very short cylindrical process, with much-branched minute internal spines which are probably desmocytes; when mature, contents of ♂ creamy white, of ♀ pink; ♀ acrocyst widely recorded, ♂ acrocyst recorded by Hancock *et al.* (1956) only.

MEASUREMENTS. See Table 24.

Table 24 *Sertularia cupressina.* Measurements in μm

	SE England (1927.7.7.10)	SW England (1961.11.4.77)	Isle of Man (1961.11.4.78)
Hydrothecae			
Outer side	280–350	240–255	245–255
Inner side, length adnate	180–220	220–240	220–240
Inner side, length free	220–250	120–140	160–180
Maximum diameter	120–160	120–130	130–150
Gonotheca (? sex)			
Length	800–920	950–1100	
Maximum diameter	400–500	280–350	

VARIATIONS. See Description.

REPRODUCTIVE SEASON. Fertile material recorded May–November in Thames estuary (Hancock *et al.*, 1956), March at Plymouth (Marine Biological Association, 1957), March–May at Roscoff (Teissier, 1965), May–July in the Faroes (Kramp, 1929), February–September in Jersey (Vervoort, 1949), February–May and again in October–December in the Kattegat (Rasmussen, 1973).

DISTRIBUTION. Common throughout most of the area, particularly the southern North Sea where it is fished (Hancock *et al.*, 1956). Found in the Kattegat (Stechow, 1927; Rasmussen 1973) but rare (Broch, 1928) or absent (Naumov, 1969) further east in the Baltic and apparently absent from Oslo Fjord (Christiansen, 1972). The North Atlantic distribution was summarized by Broch (1918).

HABITAT. Sandy bottoms from 0 to 100 m, less commonly deeper. Not intertidal but common among strand refuse.

REMARKS. Although Hancock *et al.* (1956) emphatically retained specific status for *Sertularia argentea* Linnaeus, 1758, many authors have regarded it conspecific with *S. cupressina* Linnaeus, 1758 (e.g. Pallas, 1766; Broch, 1918; Kramp, 1935; Vervoort, 1946, 1972; Leloup, 1952; Naumov, 1960, 1969). Others, like Hancock, have upheld a separation (e.g. Linnaeus, 1767; Hincks, 1868;

Nutting, 1904; Fraser, 1944; Bruce *et al.*, 1963;[17] Rees & Thursfield, 1965;[17] Calder, 1975[17]). Nevertheless, the account of Broch (1918), accepting only one species, is particularly convincing and it and the opinions of almost all European workers this century are followed here.

Sertularia echinata Linnaeus, 1761, can be regarded a junior synonym of the present species for reasons given elsewhere (Cornelius, 1975*b*).

Sertularia pinnata Pallas, 1766, was founded on two illustrations of Baster (1762 : pl. 1, figs 6a–b) which Vervoort (1946) considered might represent *S. cupressina*. However, the identity of Baster's illustrations is doubtful. It is discussed under *Diphasia nigra* (p. 267).

Sertularia uber Dalyell, 1834, was referred to *S. argentea* by Johnston (1838), and can confidently be referred to the present species.

Sertularia distans Lamouroux, 1816

(Fig. 26)

Sertularia distans Lamouroux, 1816 : 191; Allman, 1877 : 25, pl. 16, figs 9–10; Billard, 1906 : 187–191, figs 10–11 (syn. *Sertularia gracilis* Hassall, 1848; *S. tenuis* Bale, 1884; *S. pourtalesi* Nutting, 1904; *S. stookeyi* Nutting, 1904; *Dynamena mediterranea* Marktanner-Turneretscher, 1890); Picard, 1951 : 348; Robins, 1969 : 333; Millard, 1975 : 306, figs 99e–h (syn. *S. gracilis* Hassall).

Sertularia gracilis Hassall, 1848 : 2223; Hassall & Coppin, 1852 : 162–163, pl. 21, fig. 3; Hincks, 1868 : 262–263, pl. 53, fig. 2; Winther, 1879 : 305–307, pl. 6, figs 5–6; Pennington, 1885 : 113; Pictet, 1893 : 48–50, fig. 41; Pictet & Bedot, 1900 : 23; Nutting, 1904 : 57–58, pl. 3, fig. 10; Fraser, 1944 : 282–283, pl. 61, fig. 270; Vervoort, 1946 : 251; Picard, 1951 : 348; Hamond, 1957 : 317; Teissier, 1965 : 25; Redier, 1967 : 399 (syn. *S. lamourouxi:* Bedot, 1925); Fey, 1969 : 401.

Sertularia pourtalesi Nutting, 1904 : 59, pl. 5, fig. 5 (nom. nov. pro *S. distans* sensu Allman, 1877); Fraser, 1944 : 286, pl. 61, fig. 273.

Sertularia heterodonta Ritchie, 1909*c* : 79–81, fig. 4.

Sertularia distans var *gracilis:* Billard, 1912 : 465; Leloup, 1935 : 47–48, figs 28–29; Vervoort, 1949 : 154, figs 4a–b; Millard, 1957 : 221–223, fig. 12; Rees & Thursfield, 1965 : 146–147; Redier, 1966 : 85; Rees & White, 1966 : 278.

Tridentata heterodonta: Stechow, 1923 : 205.

Tridentata gracilis: Stechow, 1925 : 208, fig. G.

Sertularia distans gracilis: Millard, 1964 : 49 (syn. *S. heterodonta* Ritchie, 1909*c*).

Tridentata distans: Hirohito, 1969 : 23, fig. 1.6.

non *Dynamena distans* Lamouroux, 1816 : 180, pl. 5, figs 1a, 1B; = *D. pumila* (Linnaeus, 1758); (see p. 273).

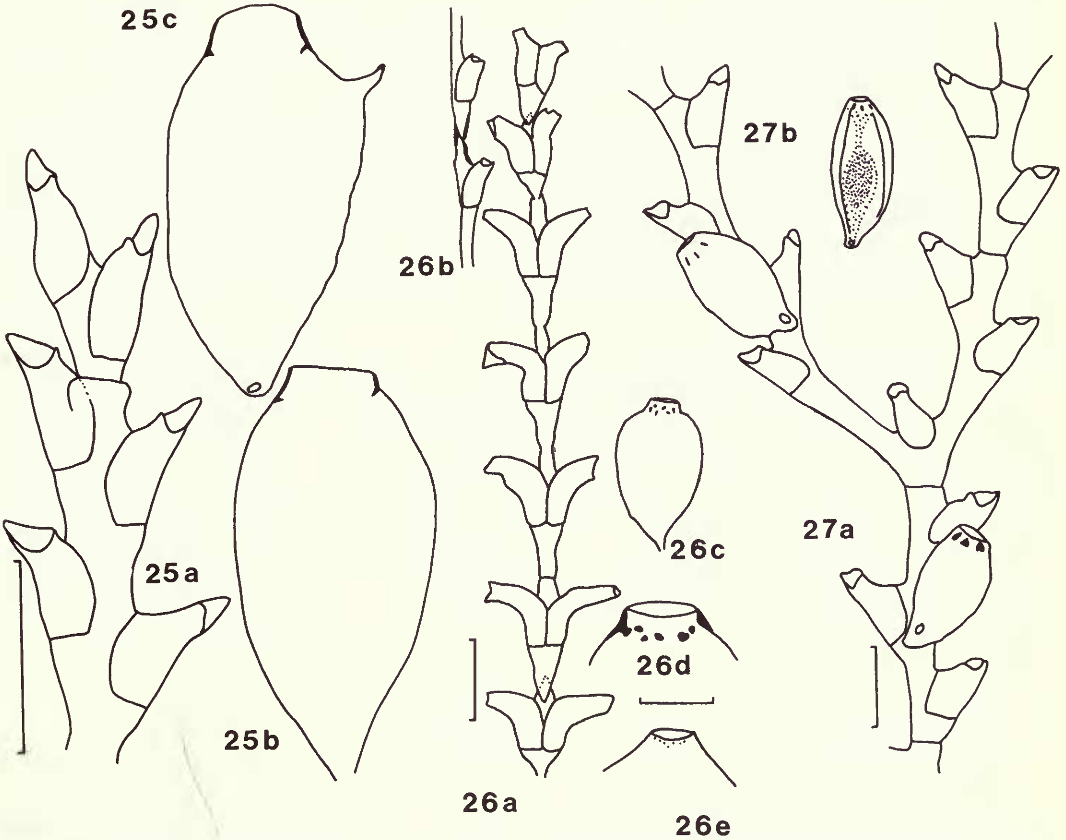
? Dynamena dubia Billard, 1922a : 344–348, fig. 1 (see note 21, p. 309).

TYPE LOCALITY AND MATERIAL. 'Australasia' (Lamouroux, 1816).[18] The type material of this species was formerly housed in the collections of the Botanical Institute, Faculty of Science, University of Caen, but was almost certainly destroyed along with the bulk of the Lamouroux collections during the Second World War (Redier, 1967). However, Billard (1906) had previously examined the material and found it to be identical with some non-type material he described and illustrated. The type material itself was apparently never illustrated.

TYPE MATERIAL OF OTHER NOMINAL SPECIES. *Sertularia gracilis* Hassall, 1848, two dense growths of fertile colonies on fragments of the red alga *Chondrus crispus* Stackh. (det. J. H. Price), 1848.7.14.6 (mentioned, Gray, 1848 : 150), and several fragments of hydrocauli on a microslide (1899.7.1.5867, ex G. Busk coll.); all material collected by J. Coppin, from Brighton, Sussex, England, and along with the next-mentioned to be regarded as the syntype series.

Two colonies in spirit and another on a herbarium sheet in the Hancock Museum, Newcastle upon Tyne, were formerly in Joshua Alder's collection (Cornelius & Garfath, in press). The spirit specimens are preserved together in a single tube, labelled '*Sertularia gracilis*, Brighton' in Alder's hand, the word 'Guernsey' having been added later by someone else. The colonies are on an alga (probably *Chondrus crispus*, det. J. H. Price). The herbarium specimen is a dense growth on an alga, also probably *Chondrus*, and is labelled 'Brighton, J. Coppin, Esq.' (the last very faint, in the lower right-hand corner of the sheet). It seems that both spirit and herbarium specimens can be regarded part of the type series.

NON-TYPE MATERIAL EXAMINED. 'Yarmouth', England, colony on alga, herbarium specimen, coll. 1807, 'Mr Wicks', 1956.6.2.23. (There is no indication whether the specimen is from Great Yarmouth, Norfolk, or Yarmouth, Isle of Wight.) R. Deben estuary, Suffolk, dense growth on dead colony of *Hydrallmania falcata* (Linnaeus, 1758), spirit, coll. D. L. Serventy, 1933.7.1.11. Off Enys Head, nr Kennack Sands, Lizard, Cornwall, 15 m, 28 May 1974, several colonies on *Laminaria* stipe, spirit, coll. J. D. George, 1975.5.14.1. Misery Point, R. Yealm estuary, S Devon, 4 Jul 1973, intertidal, several fertile hydrocladia on algae, spirit + 1 microslide preparation, coll. P. F. S. Cornelius, 1974.12.18.1–2 (Fig. 26c–e; Table 25). Swanage, Dorset, several fertile hydrocladia on microslide, coll. T. Hincks, 1899.5.1.177. Brighton, Sussex, 1806, infertile fragments on microslide, coll. 'Brodie', ex G. Busk coll., 1899.7.1.5862. Brighton, 1807, colony on brown alga, herbarium specimen, coll. 'Mr Wicks', 1956.6.2.22. Off Eastbourne, Sussex, 25 Sep 1948, fertile fragment on microslide, coll. s.s. 'Manihine' (sta. 55), 1948.9.28.83. Bridlington Bay, Yorkshire, 1928, fertile ♀ material with acrocysts (Zoological Museum, Amsterdam, colln) and 3 infertile microslide preparations (no. 172, Natural History Museum, Leiden, colln.); 'ex BM(NH) collection'! Altea, near Alicante, S Spain, 1 m, 5 Sep 1965, 8 microslides of material collected from algae,



Figs 25–27. Fig. 25 *Sertularia cupressina.* (a) terminal region of hydrocladium, (b–c) gonothecae, SE England (1927.7.7.10), scale (a–c) = 500 μm. **Fig. 26** *S. distans.* (a) terminal region of hydrocaulus, S Spain (1965.10.8.1–8); (b) an oblique node, lateral view, Azores (1962.2.10.15); (c–e) gonotheca, and aperture regions of two others, SW England (1974.12.18.1–2); scale (a–c) = 500 μm, (d–e) = 200 μm. **Fig. 27** *S. tenera.* (a–b) hydrocladia with ♂ gonothecae, and separate ♂ gonotheca, W Sweden (1911.12.8.23); scale = 500 μm.

coll. Miss J. Royston, 1965.10.8.1–8 (Fig. 26a; Table 25). Frodinhas, Azores, 10 m, Aug 1959, two hydrocladia on microslide, coll. Imperial College Azores Expedition, 1962.2.10.15 (Fig. 26b).

Description. Colony comprising a creeping stolon and irregularly spaced erect hydrocauli, 50–125 mm, occasionally branched. Hydrothecae often lacking from base of hydrocaulus; in opposite pairs, distance between successive pairs equal to or longer than attached part of hydrotheca, sometimes much longer. Hydrotheca tubular, sharply or gradually outward-curving (Fig. 26), length : breadth ratio from 2 to 8; aperture 2-cusped, occasionally with minute to small third cusp on outer margin, rim sometimes renovated; 2-flapped operculum. Members of a pair of hydrothecae often contiguous but (Millard, 1957; present material) this variable even along a hydrocaulus. About half inner wall adnate, but this proportion smaller in longer hydrothecae. Nodal contrictions of two kinds, oblique and transverse (Fig. 26a); oblique nodes between every second or third pair of hydrothecae, transverse nodes usually alternating with them. Occasional distal stolons (e.g. BM(NH) 1962.2.10.16). Hydranth said to have abcauline diverticulum of enteron when contracted (Billard, 1925; Millard, 1957; Hirohito, 1969); living ectoderm sometimes with dark speckling (Picard, 1951; Hamond, 1957). Gonotheca ♂ = ♀, ovoid, smooth, thin walled, aperture broad, terminal, on short collar of indefinite length or lacking; base pedicellate; borne on hydrocaulus below hydrothecae (Vervoort, 1949; Hirohito, 1969) or sometimes (Leloup, 1935) on stolon of colony; ♀ gonotheca said to contain a single egg by Vervoort (1949) but Millard (1975) illustrated several eggs, retained in an acrocyst.

Measurements. See Table 25.

Table 25 *Sertularia distans*. Measurements in μm

	S Spain (1965.10.8.7)	SW England (1974.12.18.1)
Hydrotheca		
Outer side	420–450	230–250
Inner side, length adnate	270–300	110–130
Inner side, length free	260–290	190–220
Maximum diameter	110–130	90–120
Diameter of aperture	90–120	70–90
Gonotheca (♂ = ♀)		
Length		880–900
Maximum diameter		520–600
Diameter of aperture		130–170

Variations. The following morphological features have been used by various authors in defining the present species but appear to be sufficiently variable to be unreliable systematic characters: hydrothecal length, abruptness of hydrothecal flexure, distance between two hydrothecae of a pair (which may touch), vertical distance between one pair of hydrothecae and the next; presence or absence of speckling in living ectoderm of hydranth, presence or absence of collar beneath gonothecal aperture, presence or absence of hydrothecae near base of hydrocaulus, degree of distal tapering of each hydrotheca, number of pairs of hydrothecae between oblique internodes (1–3 pairs).

Reproductive season. Fertile material recorded April–September at Roscoff (Teissier, 1965), May–June in the Channel Isles (Vervoort, 1949), July in Norfolk (Hamond, 1957), July–September along south coast of England (present material).

Distribution. Widespread in warm Atlantic coastal waters (Millard, 1957), reaching the south coast of England, NW Wales and Norfolk, and probably sporadically further north to Yorkshire. Apparently unrecorded from 'Ireland', Belgium or Holland (Vervoort, 1946; Leloup, 1952). Vervoort's (1949) appraisal of the species as 'comparatively rare along the Channel coasts of France and Great Britain' seems apt. However, widespread records of fertile specimens from the English Channel suggest that at least in some years the species finds suitable conditions there. All records are given: St Malo and Roscoff (Vervoort, 1949; Teissier, 1965), Channel Isles (Vervoort, 1949), Scilly Isles (Robins, 1969), S Cornwall (present material), Dorset (Hincks, 1868; Waddington, 1914), Sussex, Devon, Cornwall and Norfolk (Hincks, 1868), Kent (Sorby, 1908), Pembrokeshire (P. J. Hunnam, pers. comm.), Bangor and Bardsey Island, Anglesey, N Wales (Pennington, 1885; Pyefinch, 1943; K. Hiscock, pers. comm.), Suffolk (present material), Norfolk (Hamond, 1957), Yorkshire (present material). Records from Durham, Shetland, Blackpool and the Clyde Sea (Hincks, 1868; Norman, 1869; Pennington, 1885; Rankin, 1901) seem unusually far north and may be invalid.

HABITAT. Recorded in the present area from the intertidal zone (present material) down to 60 m (Teissier, 1965). Hamond (1957) found the usual substrate to be *Hydrallmania falcata* (Linnaeus, 1758) in Norfolk waters but use of a variety of plant, animal and inanimate substrates has been recorded in other places.

REMARKS. The nominal species *Sertularia gracilis* Hassal, 1848, type localities Brighton and Ramsgate (Hassal & Coppin, 1852), has been regarded as valid by some authors and as a variety or subspecies of *S. distans* Lamouroux, 1816, by others (see synonymy); but in agreement with Billard (1906, 1925) and Millard (1975) the two are here regarded conspecific. Distinguishing features between the two taxa were apparently not given until Picard (1951) presented a synopsis, and the widespread use of the combination '*S. distans* var. *gracilis*' seems ill founded. There seems little doubt that the type material of *S. gracilis* can be referred to *S. distans*.

Hirohito (1969) referred the present species to the genus *Tridentata* Stechow, 1920, since that genus was diagnosed as having an abcauline diverticulum of the enteron; but since *Sertularia* as restricted by Broch (1918), Millard (1975) and others has one too this transfer seems unnecessary.

Dynamena distans Lamouroux, 1816, is here referred to *D. pumila* (see p. 273).

The two similar-looking species here called *Dynamena pumila* (p. 271) and *Sertularia distans* (present species) probably occur together in some places at low shore levels and in the shallow sublittoral. A useful recognition mark seems to be the 'oblique' nodal constrictions of the present species, lacking in *D. pumila*, while the presence (in *S. distans*) or absence (in *D. pumila*) of a hydranth caecum might help with difficult material.

The present species was also redescribed by Millard (1975). The similar species *D. dubia* Billard, 1922a, is discussed in note 21 (p. 309).

Sertularia tenera Sars, 1874

(Fig. 27)

Sertularia tenera Sars, 1874 : 108–109, pl. 4, figs 1–4; Broch, 1910 : 171–173, figs 27–28, pl. 2, fig. 5; Kudelin, 1914 : 148–165, figs 21–24; Broch, 1918 : 127–130, fig. 67 [syn. *S. arctica* Allman; *S. albimaris* Thompson; *S. argentea* sensu Bergh; *S. dijmphnae* Bergh; *S. unilateralis* Bonnevie; *S. thomsoni* (sic) Schydlowsky]; Kramp, 1935 : 192–193, fig. 79B; Naumov, 1960 : 353–354, fig. 244; Rees & Thursfield, 1965 : 148; Naumov, 1969 : 382, fig. 244; Calder, 1970 : 1536, pl. 8, fig. 1; Christiansen, 1972 : 302; Vervoort, 1972 : 184 (syn. *S. arctica* Allman).

Sertularia arctica Allman, 1874*b* : 179; Allman, 1876 : 264, pl. 14, figs 1–2; Jaderholm, 1909 : 93–95, pl. 10, figs 5–13.

? *Sertularia cupressina* var. *tenera:* Winther, 1879 : 309–311, pl. 6, figs 7–16 (see p. 301).

Sertularia albimaris: Thompson, 1884 : 5, pl. 1, figs 1–3; (non Mereschkowsky, 1878 : 331–332, pl. 14, figs 3–5; see Remarks).

Sertularia thomsoni (sic) Schydlowsky, 1902 : 213–215, pl. 5, figs 55–61 (nom. nov. pro *S. albimaris* sensu Thompson, 1884); Jaderholm, 1909 : 92–93, pl. 9, figs 11–12 (but not 13).

Thuiaria tenera: Nutting, 1904 : 70, pl. 11, figs 9–12; Ritchie, 1911 : 218–220, figs 2–5; Fraser, 1944 : 308, pl. 65, fig. 295.

TYPE LOCALITY AND MATERIAL. 11 'miles' WNW of Skudesnäs, SW Norway (59° 09′ N, 5° 17′ E), 273 m ('150 fm'), infertile colony (Sars, 1874); material not located.

Material examined. (The Scottish records seem dubious; see Distribution.) All BM(NH) material of this species is listed. Spitzbergen, 3 infertile colonies, micro-preparations, pres. A. E. Eaton, 1874.4.4.57. Spitzbergen, several fragments in spirit and on 4 microslides, ♂ & ♀ gonothecae represented, coll. G. M. R. Levinsen, 1911.12.8.23 (Fig. 27; Table 26). Gåsö Ranna, Gullmarsfjord, W Sweden, 20–30 m, 27 Aug 1962, several infertile fragments in spirit, coll. and det. W. J. Rees, 1962.11.8.17. ? Off Tighnabruaich, Kyles of Bute, Argyll, Scotland, Jun 1910, fertile fragments of separate colonies on 2 microslides, coll. J. Ritchie, 1964.8.7.165–166 (mentioned, Ritchie, 1911; Rees & Thursfield, 1965) (see Remarks). ? Off Mull of Kintyre, Argyll, 100 m, infertile fragments taken from colony epizoic on *Halecium muricatum* (Ellis & Solander, 1786), preserved on microslide, coll. Sir John Murray, pres. J. Ritchie, 1964.8.7.164 (mentioned, Ritchie, 1911; Rees & Thursfield, 1965) (see Remarks). ? 'Between the Cumbraes', Firth of Clyde, W Scotland, 30–50 m, 8 Jul 1885, branched infertile specimen in spirit, coll. and det. A. M. Norman, 1912.12.21.375 (see Remarks).

Description. Colonies 100–150 mm, erect, monosiphonic, alternate-pinnate basally but often spiral distally, hydrocaulus slightly wider than hydrocladia, some secondary branching (dichotomous or alternate). Main stem straight to flexuose (Naumov, 1969). Hydrocladia usually without hydrothecae for basal 2–3 hydrotheca-lengths, characteristically much narrowed basally; axillary hydrotheca present. Hydrothecae in sub-alternate pairs with nodal constrictions between every second to sixth hydrotheca; widest in centre, tapering proximally and rather more distally; outer wall usually almost straight but often slightly concave with a bend midway along (Fig. 27a); if straight tending to form continuous line with edge of perisarc below [see Broch (1910) and Kudelin (1914) for longer accounts of variation in shape of hydrotheca]; aperture with two rounded cusps, equal or outer longer; operculum 2-flapped, outer larger (Calder, 1970). Hydranth with abcauline diverticulum (Calder, 1970); otherwise apparently undescribed. Gonothecae previously described as dimorphic (e.g. Broch, 1910, 1918; Ritchie, 1911; Kudelin, 1914; Naumov, 1969; Calder, 1970); either ovoid, 4–6 sided in cross-section, with as many longitudinal ribs, terminal aperture on short, wide collar, with branched internal spines (? desmocytes); or similar but circular in cross-section, terminal spines not recorded; sometimes with an equatorial constriction (see Remarks). Broch (1910) considered ♂ polygonal and ♀ circular in cross-section, but Naumov (1969) found both kinds on one colony. The present material includes both ♂ and ♀ polygonal gonothecae, so it seems unlikely that there is always sexual dimorphism. Possibly polygonal and tubular gonothecae represent ends of a continuous series. ♀ gonothecae in BM(NH) material appear to contain only one egg each.

Measurements. See Table 26.

Table 26 *Sertularia tenera*. Measurements in μm

	U.S.S.R. (Naumov, 1969)	Canada (Calder, 1970)	W Scotland (?)† (Ritchie, 1911)	Spitzbergen (1911.12.8.23)
Hydrotheca				
Outer side	310–480			390–510
Inner side, length adnate	270–350	280–340	140–280	230–250
Outer side, length adnate	150–350	230–310	170–290	280–350
Maximum diameter			140–170	230
Diameter of base	150–210	140–200		180–220
Diameter of aperture			60–100	90–140
Gonotheca				
Length	830–940		810–1330	900–940
Maximum diameter	420–480		310–440	320–440
Diameter of aperture	200			130–170

† Locality dubious – See Remarks.

VARIATION. See under Description, above.

REPRODUCTIVE SEASON. Fertile material recorded 14 July to 24 August in Barents Sea and 28 July in White Sea (Kudelin, 1914). The fertile material said to have been collected by James Ritchie in Scotland, listed above, is dated June 1910, but the locality seems dubious (see Distribution).

DISTRIBUTION. Known in the present area from Gullmarsfjord, W Sweden (present material), from the Skagerrak and Kattegat (Kramp, 1935; Rasmussen, 1973) and dubiously reported from a few Scottish localities (see below). Although recorded from Oslo Fjord by Kramp (1935) this record was doubted by Christiansen (1972). The species has been widely recorded in arctic and sub-arctic Atlantic waters (summaries in Broch, 1918; Kramp, 1929; Naumov, 1969; Calder, 1970) and has been recorded on the edge of its normal range (and just outside the present area) from the Faroes (twice, Kramp, 1929) and from the type locality in SW Norway.

The Scottish records (see Material list), from the warm west coast, are thus surprising. The two Ritchie specimens from Tighnabruaich, Argyll, are dissimilar in detail and might well not be both from the same original collection. The Mull of Kintyre specimen came to Ritchie via Sir John Murray [cf. the here discredited record of *Sertularia mirabilis* (p. 307)]. For the present there seems no way of assessing further Ritchie's *S. tenera* records or that of A. M. Norman from the Firth of Clyde (present material), and they should be regarded sceptically. *S. tenera* was not listed by Rankin (1901) or Chumley (1918) in their detailed Clyde Sea fauna lists.

HABITAT. On stones and shells, sub-littoral to edge of Continental Shelf (Kramp, 1929); recorded on *Halecium muricatum* (by Ritchie, 1911; see present Material list), but record perhaps dubious (see under Distribution).

REMARKS. In vegetative morphological characters *S. tenera* resembles closely *S. cupressina* Linnaeus, 1758, and some infertile specimens may be difficult to identify. Indeed, Winther (1879) regarded *tenera* as a variety of *S. cupressina*. Nevertheless, *S. tenera* seems to be valid and can be identified on the basis of the following characters (largely after Broch, 1910). Compared with *S. cupressina*, hydrothecae of *S. tenera* are larger and more divergent from the hydrocaulus, usually with a straighter outer edge; hydrocladia are narrower than the stems and usually lacking hydrothecae basally in *S. tenera*, equal in thickness and having hydrothecae almost down to the base in *S. cupressina;* gonothecae are sometimes ovoid in both species but often have two or more terminal spines in *S. cupressina* (but sometimes no spines) while lacking terminal spines and often being polygonal in cross-section in *S. tenera*; ♀ acrocysts (once ♂ (? incorrect), Hancock *et al.*, 1956) are present in *S. cupressina* and have several eggs, whereas both ♂ and ♀ gonosomes are intracapsular in the present material of *S. tenera*, the ♀ having just one egg.

Naumov (1969) followed Broch (1910) in uniting *Sertularia arctica* Allman, 1874*b*, and *S. thomsoni* Schydlowsky, 1902, with the present species, and these synonymies seem correct. The type material of *S. arctica* was evidently unusual in that the gonotheca had an equatorial constriction. Ritchie (1911) recorded similar material.

Sertularia albimaris Mereschkowsky, 1878, has been distinguished from the present species in having hydrothecae which are shorter and largely fused with the hydrocaulus, and in having a lamellar hydrorhiza (Naumov, 1960, 1969). Naumov included *S. thomsoni* Schydlowsky, 1902, in its synonymy but following Kudelin (1914) *S. thomsoni* is here regarded conspecific with *S. tenera*. *S. albimaris* Mereschkowsky is a northern species reported from the North Sea by Naumov (1960, 1969) but it is not certain that this record comes within the present area, from which it seems unrecorded.

***Symplectoscyphus tricuspidatus* (Alder, 1856)**

(Fig. 28)

Corallina minus ramosa alterna vice denticulata, . . . Ellis, 1755 : 5–6, pl. 2, figs A, a, B, b.

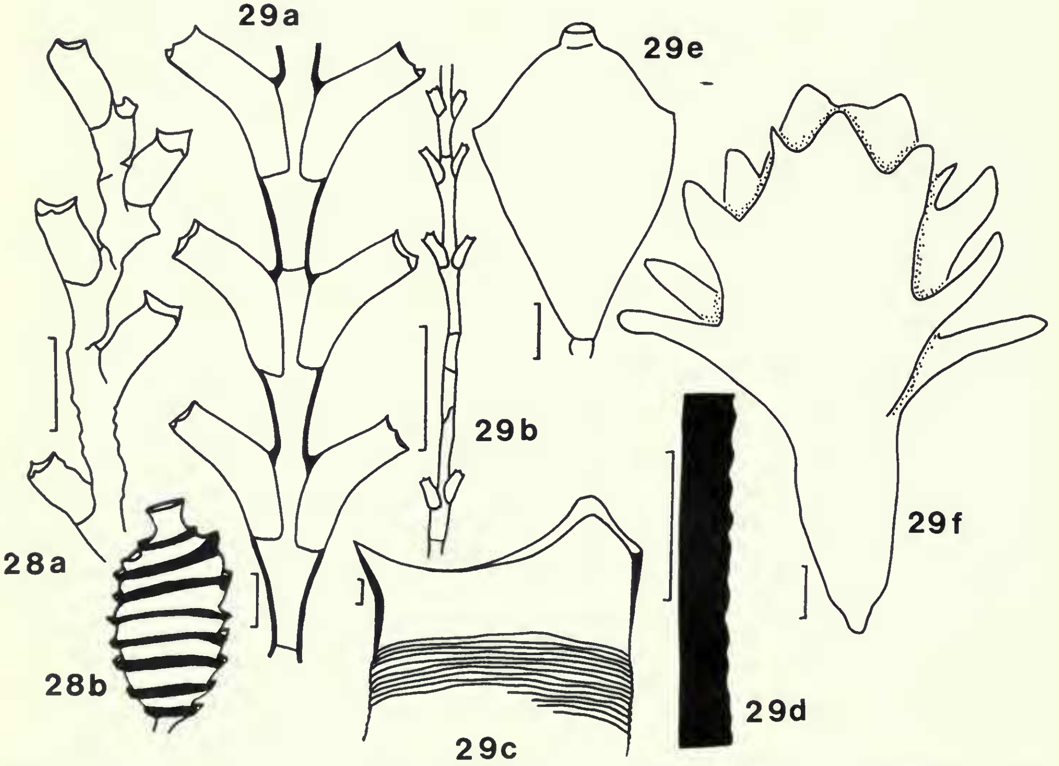
Sertularia polyzonias Linnaeus, 1758 : 813 (part); Linnaeus, 1767 : 1312 (part); Oken, 1815 : 92 (part); Esper, 1829 : 173–177 (part).

Sertularia ericoides Pallas, 1766 : 127–128 (part) (nom. nov. pro *S. polyzonias* Linnaeus and *S. flexuosa* Linnaeus); Pallas, 1768 : 158–160 (part); Oken, 1815 : 92 (part); Esper, 1829 : pl. 12, figs 1–2.

Sertularia tricuspidata Alder, 1856 : 356–357, pl. 13, figs 1–2; Alder, 1857 : 111–112, figs 1–2.

Sertularella tricuspidata: Hincks, 1868 : 239–240, pl. 47, fig. 1, text-fig. 30 (syn. *Sertularia ericoides* sensu Esper); Hartlaub, 1901 : 23, 127–129, pl. 2, figs 41–42 (syn. *S. ericoides* Pallas); Nutting, 1904 : 100–102, pl. 25, figs 3–7 (syn. *Sertularella pallida* Kirchenpauer, 1884; *S. hesperia* Torrey, 1902); Broch, 1910 : 168–170, 214–215, fig. 25; Broch, 1918 : 98–99; Kramp, 1929 : 22; Kramp, 1935 : 179; Vervoort, 1942 : 292; Kramp, 1943 : 33–34; Fraser, 1944 : 274–277, pl. 60, fig. 264; Naumov, 1960 : 348–349, fig. 240; Naumov, 1969 : 376–377, fig. 240; Calder, 1970 : 1531, pl. 6, figs 7–8. [non *Sertularella tricuspidata:* Ritchie, 1907a : 536 (= *Symplectoscyphus articulatus* (Allman) (Stechow, 1923 : 173; Rees & Thursfield, 1965 : 132)].

Symplectoscyphus tricuspidatus: Stechow, 1923 : 173; Yamada, 1950 : 10, pl. 1, fig. 9; Rees & Thursfield, 1965 : 132; Vervoort, 1972 : 166–168, fig. 54.



Figs 28–29. **Fig. 28** *Symplectoscyphus tricuspidatus.* (a–b) terminal region of hydrocladium, and gonotheca, SW Canada (1898.6.4.2), scale = 500 μm. **Fig. 29** *Tamarisca tamarisca.* (a) part of hydrocladium, Faroes (1964.8.7.109), scale = 500 μm; (b) hydrocaulus with unusually long internodes, 'E Coast of Britain' (1899.7.1.5923), scale = 5 mm; (c) detail of (?) unusual hydrotheca with finely ridged surface, NE Scotland (1964.8.7.110), scale = 50 μm; (d) optical section through hydrothecal wall of (c), external surface on right, scale = 50 μm; (e) ♂ gonotheca, as (b), scale = 500 μm; (f) ♀ gonotheca, Bay of Biscay (1961.11.4.5), scale = 500 μm.

TYPE LOCALITY AND MATERIAL. 'On zoophytes from deep water on the Northumberland coast' (Alder, 1856). Fragments in spirit, Hancock Museum, Newcastle upon Tyne, England, without collecting data but designated type material by Nutting (1904). Four herbarium specimens on one sheet in the BM(NH) collection (1919.4.5.6), presented by Alder in 1856 or 1857, labelled 'Northumberland Coast', can also be regarded part of the type series. Additional type material in the Hancock Museum has been listed by Cornelius & Garfath (in prep.)

OTHER MATERIAL EXAMINED. *Eastern North Atlantic* Carl I., Spitzbergen, fragment in spirit, coll. A. E. Eaton, 1874.4.4.60. Bear I., Spitzbergen, strandline, fragments in spirit, coll. Oxford

University Spitzbergen Expedition, 1922.1.19.11. Bear I., 1930, fertile colonies in spirit, coll. J. A. Robertson, 1931.6.29.13. E of Faroes, 62° 00′ N, 6° 12′ W ('Goldseeker' sta. 16), 120 m, 25 Aug 1906, fragment of colony on microslide, ex coll. J. Ritchie, 1964.8.7.136 (mentioned, Rees & Thursfield, 1965 : 132). Off Northumberland, fragments of several colonies in spirit, coll. A. M. Norman, 1912.12.21.341. 'North Sea', pre-1857, three fragments on 2 microslides, purchased from L. Barrett, 1857.10.14.38 (Table 27).

North American waters R. St Lawrence, Canada, coll. 'Mr Whiteaves', ex coll. A. M. Norman, 1912.12.21.344. Off Cape Cod, Massachusetts, U.S.A., several colonies in spirit, coll. U.S. Fisheries Commission, pres. Smithsonian Institution, 1890.8.23.10. Unalaska I., Aleutian Is, several colonies in spirit, coll. d'A. W. Thompson, pres. Queen's College, University of Dundee, 1956.10.1.40. Vancouver, British Columbia, Canada, fertile colony on microslide coll. C. F. Newcombe, 1898.6.4.2. (Figs 28a–b).

DESCRIPTION. Hydrocauli erect, monosiphonic, branched, flexuose, bearing hydrothecae at the bends. Hydrocladia similar to hydrocauli; typically 3–5 hydrothecae between bases of successive hydrocladia. Colonies up to 150 mm (Naumov, 1969), but usually 50 mm or less. Perisarc of hydrocaulus variably rugose. Usually transverse to slightly oblique annulus above each or every second hydrotheca. Hydrothecae tubular to barrel-shaped, smooth walled to coarsely rugose, 2–3 times longer than wide. Outer side of hydrotheca often forming continuous curve with side of hydrocaulus below, but this sometimes interrupted by rugosities of perisarc; ½–⅓ of inner side adnate; rim tricuspid, roundly cleft to varying extent; usually one cusp proximal and two distal but often irregular; renovations common; operculum 3-flapped. Hydranth apparently undescribed. Gonotheca ♂ = ♀, elongate to ovoid, 7–9 washer-shaped annular ribs; aperture terminal, at end of short tube, even, slightly flared; gonothecal pedicel short, inserted below hydrotheca.

MEASUREMENTS. See Table 27.

Table 27 *Symplectoscyphus tricuspidatus*. Measurements in μm

	U.S.S.R. (Naumov, 1969)	N Canada (Calder, 1970)	Japan (Yamada, 1950)	N Atlantic (Vervoort, 1972)	North Sea (1857.10.14.38)
Hydrotheca					
Outer side	350–560	490–570	340	310–350	580–640†
Inner side, length adnate	230–350	230–260		220–250	230–320
Inner side, length free	370–520	390–470		310–330	270–320
Diameter of aperture	290–330	230–270	250	200–220	220–250
Maximum diameter				230–250	210–270
Internode					
Length		700–1200		720–880	480–580
Gonotheca (♂ = ♀)					
Length	1600 (max)		1700		
Maximum diameter	850				

† Measured to junction with hydrocaulus.

VARIATIONS. The three hydrothecal cusps are usually placed so that two are distal and one is proximal, but the reverse condition occurs commonly and the cusps are not always equally spaced. The indentations between them are of various depths, but seem to be constant within each hydrotheca. Broch (1910) described variations in hydrothecal morphology. Internode length also varies (Table 27).

DISTRIBUTION. Circumpolar, in arctic to northern boreal waters (Broch, 1918; Naumov, 1969), occurring at least as far north as 79½° N (Jaderholm, 1909). Although recorded south to northern England the present status of the species in British waters is unclear, the most recent published British record being from the Moray Firth, Scotland, in 1935 (Vervoort, 1942). Previous records and specimens from the present area include only Northumberland (type locality; also Alder, 1865; these records repeated by Norman, 1905, and Robson, 1914); Cumberland (Pennington, 1885 – a dubious record since it is almost the only record from the British west coast, and also the most southerly record of the species in the Atlantic); an unsubstantiated record from the Clyde Sea by Rankin (1901), not repeated by Chumley (1918); and 'North Sea' (BM(NH) 1857.10.14.38; Broch, 1928; Naumov, 1969). The species was not recorded in faunal lists of the Baltic, Danish waters and Oslo Fjord (Stechow, 1927; Broch, 1928; Christiansen, 1972). Available evidence suggests that the southern limit of the species has moved northwards from the southern North Sea during the past 100 years.

A record of the species from sub-antarctic waters (Naumov & Stepan'yants, 1962) has been doubted (Vervoort, 1972), as has the antarctic record of Ritchie (1907*a*) which has been referred to *S. articulatus* (Allman, 1888) (Stechow, 1923; Rees & Thursfield, 1965). The species seems otherwise unrecorded from the southern hemisphere.

REMARKS. Although Ellis (1755) stated that there were two species included in his 'Great Tooth Coralline', Linnaeus (1758) united them in the single taxon *Sertularia polyzonias*.[19] Pallas (1766) provided the name *S. ericoides* to include both this Linnean species and also *S. flexuosa* Linnaeus, 1758. Subsequently, Linnaeus (1767) and Pallas (1768, 1787) each used his own name for the composite taxon. F. L. Hammer (in Esper, 1829) stated that the two names referred to a single species, and used the senior name *polyzonias*, of which *ericoides* is in fact a junior objective synonym. When Alder (1856) independently recognized the existence of two species within *S. polyzonias* sensu Linnaeus he provided the new name *S. tricuspidata* for specimens with three-cusped hydrothecal rims, confusingly commenting that his species resembled *S. ericoides* sensu Hammer. This was the first time since Ellis' (1755) account that the two species had been recognized and the first time that a binomen had been applied solely to the present species.

S. flexuosa Linnaeus, 1758, seems referable to *S. polyzonias* s. str. (see p. 290).

Tamarisca tamarisca (Linnaeus, 1758)

(Fig. 29)

Corallina vesiculata sparsim et alternatim ramosa . . . Ellis, 1755 : 4, pl. 1, figs A, a.
Sertularia tamarisca Linnaeus, 1758 : 808.
Diphasia tamarisca: Hincks, 1868 : 254–255, pl. 51.
Sertomma tamarisca: Stechow, 1919 : 853; Stechow, 1923 : 159; Rees & Thursfield, 1965 : 118–119.
Sertularella (*Tamarisca*) *tamarisca:* Kudelin, 1914 : 480, 509–514.
Tamarisca tamarisca: Naumov, 1960 : 327–329, fig. 218; Naumov, 1969 : 354–355, fig. 218; Vervoort, 1972 : 184–185.

TYPE MATERIAL AND LOCALITY. The collections of Linnaeus in the Linnean Society of London include a single herbarium sheet bearing an infertile colony labelled *Sertularia tamarisca* (numbered 1298.3 by Savage, 1945). It does not appear to be *S. tamarisca* Linnaeus *sens. auct.*, e.g. Hincks, 1868, however, but is probably a species of *Abietinaria* sens. Naumov, 1969. The specimen is not well preserved but some hydrothecae have the remains of single-flapped adcauline operculae. Meanwhile there are in the BM(NH) collections two microslide preparations evidently also of Linnean material. They were formerly in the collections of George Busk (a one-time Secretary of the Linnean Society) and were labelled by him as follows: 'Sertularia tamarisca. Linn. herb.! (ms)' [BM(NH) registered numbers 1899.7.1.6300–6301]. Each slide bears an infertile fragment of hydrocaulus identical in appearance with the hydrocauli of the Linnean Society specimen, of which the BM(NH) specimens appear to be sub-samples.

However, as Linnaeus' designation includes male gonothecal characters ('calycibus obovatis bidentatis') it seems probable that these specimens are non-type and that, as with other sertularian hydroids, Linnaeus based the designation on the very clear illustration of Ellis (1755 : pl. 1, figs A, a). The specimen in the illustration, which shows male gonothecae, can thus be taken as holotype. It is probably lost (p. 251). It was taken 'in very deep water, near the Island of Dalkey, at the entrance of the harbour of Dublin', Eire (Ellis, 1755 : 4). The type locality of the species may be restricted to this area.

OTHER MATERIAL EXAMINED. Faroes, 62° 00′ N, 6° 12′ W ('Goldseeker' sta. 16), 120 m, 25 Aug 1906, fragments of 2 hydrocladia on microslide, coll. J. Ritchie, 1964.8.7.109 (Fig. 29a; mentioned, Rees & Thursfield, 1965 : 118). NW of Shetlands, 61° 35′ N, 0° 47′ E ('Goldseeker' sta. 10), 204 m, 3 Sep 1906, part of colony on microslide, coll. J. Ritchie, 1964.8.7.108 (mentioned, Rees & Thursfield, 1965 : 118). N of Orkneys, 59° 46′ N, 2° 21′ W ('Goldseeker' sta. 21), 92 m, 29 Aug 1906, 4 hydrocladial fragments on microslide, coll. J. Ritchie, 1964.8.7.110 (Figs 29c–d; mentioned, Rees & Thursfield, 1965 : 118). Bridlington Bay, Yorkshire, infertile fragment on microslide, coll. s.s. 'George Bligh', 1956.2.2.11. East coast of Britain, ♂ colony on microslide, coll. G. Busk, 1899.7.1.5923 (Fig. 29b, e; Table 28). Bay of Biscay, 7 Jan 1922, fragments of female colony on 3 microslides, coll. E. T. Browne, 1961.11.4.5, 6 & 8 (Fig. 29f; Table 28).

DESCRIPTION. Colony up to 150 mm, upright, robust, branched loosely, alternately (sometimes opposite), in one plane; hydrocaulus monosiphonic; appearance of colony often reminiscent of finer branches of the tamarisc tree (*Tamarix* L.). Hydrothecae on both stem and branches; often very large (see Measurements); (sub)opposite, biseriate; nodal constrictions immediately above each pair and varying distance below; each hydrotheca roughly tubular, ½ adnate, variably outward-curving; rim 3-cusped, sometimes renovated, with 3-flapped operculum; hydrothecal surface sometimes finely ribbed (Fig. 29). Hydranth ? undescribed, in present material (1961.11.4.8) lacking enteron diverticulum, having *c*. 15 tentacles. ♂ gonotheca flattened, heart-shaped; proximal, pointed end pedicellate; two distal outer corners approximately 90°; aperture terminal, central, circular, on short tube. ♀ gonotheca 'conical, its distal end bearing 3 large flattened lobes with ramified distal margins; with a pair of identical lobes covering the aperture of the gonotheca in the form of a gabled roof; with a third, narrower lobe situated on the adjacent side, located between the other two, bending inwards' (Naumov, 1969). Notes on reproduction were given by Allman (1864). Hincks (1868) recorded monoecious material.

MEASUREMENTS. See Table 28.

Table 28 *Tamarisca tamarisca*. Measurements in μm

	U.S.S.R. (Naumov, 1969)	Bay of Biscay (1964.11.4.5, 6, 8)	E coast of Britain (1899.7.1.5923)
Hydrotheca			
Outer side	1350–1600	1100–1420	1080–1230
Inner side, length adnate	900–1150	550–800	600–710
Inner side, length free	880–1050	600–750	600–710
Diameter of aperture	500–600	330–390	340–390
♂ gonotheca			
Length	3000		2400–2800
Maximum diameter	2000		500–720
♀ gonotheca			
Length	5000	4900–5100	
Maximum diameter		3000–3200	

VARIATION. The distance between the proximal end of a hydrothecal pair and the nodal constriction below may vary widely within a single hydrocladium (Fig. 29b), resulting in variation of internode length. In one of the illustrated specimens basal parts of the hydrocladia are devoid of hydrothecae. There is variation between colonies in the degree of outward curvature of the hydrothecae, some being almost straight.

REPRODUCTIVE SEASON. Fertile material recorded April, NW France (Teissier, 1965). Notes on reproduction were given by Allman (1864).

DISTRIBUTION. Scattering of records throughout the present area excepting certain regions, suggesting a patchy distribution. Not recorded from Dutch and Belgian waters (Vervoort, 1946; Leloup, 1952) and apparently not present in the Baltic (Stechow, 1927; Broch, 1928) or the Channel Isles (Vervoort, 1949). Said, however, to be common in northern Britanny (Teissier, 1965). Apparently no other records from north coast of France, but records from SW England are numerous. The species 'never seems to occur in abundance' (Vervoort, 1972). Hincks (1868), writing of the distribution in Britain, stated 'Though not an abundant species, [it] is very widely distributed'.

HABITAT. Little information. Apparently occurring over much of the Continental Shelf at depths greater than about 10 m.

REMARKS. There seems no reason for systematic revision of this distinctive species at present. There has, however, been some confusion in recent literature regarding the generic names *Tamarisca* Kudelin (1914 : 480, 508; as sub-genus of *Sertularella* Gray, 1848) and *Sertomma* Stechow (1919 : 853). The sub-genus *Tamarisca* was raised to generic status by Naumov (1960 : 327). Rees & Thursfield (1965), however, continued to use the name *Sertomma* in preference. *Sertularia tamarisca* Linnaeus, 1758, is type species of both the sub-genus *Tamarisca* Kudelin, 1914, and of the genus *Sertomma* Stechow, 1919 (in each case by both original designation and monotypy). The current conventions of zoological nomenclature give equal status to genera and sub-genera for the purpose of priority so that *Sertomma* can be considered a junior objective synonym of *Tamarisca*.

Problematical record

Sertularella cylindritheca (Allman, 1888)

Sertularia cylindritheca Allman, 1888 : 59–60, pl. 29, figs 1, 1a.
Sertularella cylindritheca: Vervoort, 1972 : 126, fig. 39a.

DISTRIBUTION AND REMARKS. Dr W. Vervoort has kindly shown me three infertile hydrocladia of this species collected from deep water off the coast of Norfolk (53° 19′ N, 0° 42′ E, 90 m, coll. r.v. 'Aurelia', 17 Oct 1975; Leiden Museum collection). The hydrocladia, which contain tissues and were evidently alive when collected, resemble the type material (off Bahia, Brazil, coll. H.M.S. 'Challenger', fragments of colony in spirit, BM(NH) reg. no. 1888.11.13.47) in all essential features.

The previously recorded distribution apparently extends no further north on the eastern side of the Atlantic Ocean than the Straits of Gibraltar (Vervoort, 1972). The present material was received by Dr Vervoort through the Leiden Museum collection sorting facilities and we are in agreement that the locality data should not be regarded as conclusively proved.

Species erroneously recorded

(See also notes on Distribution under *Sertularia tenera*, p. 301.)

Parascyphus simplex (Lamouroux, 1816)

Laomedea simplex Lamouroux, 1816 : 207.
Parascyphus simplex: Ritchie, 1911 : 160–162, fig. 1; Totton, 1930 : 179–180, fig. 29; Ralph, 1961 : 755, fig. 1b; Rees & Thursfield, 1965 : 117–118.

DISTRIBUTION AND REMARKS. Apart from a single specimen dubiously stated by Ritchie (1911) to have been collected between Sanda Island and Ailsa Craig, Scotland, the species has not been recorded from the North Atlantic. However, several authors (Chumley, 1918; Totton, 1930; Ralph, 1961; Rees & Thursfield, 1965) have accepted Ritchie's record, apparently only Kramp (1947) noting that the Scottish locality was unusual.

The specimen, a microslide preparation of part of a colony, carries two BM(NH) registered numbers: 1964.8.7.106 (not 107 as stated by Rees & Thursfield) and 1888.3.19. The latter number relates to a small collection of hydroids made from Sanda by Sir John Murray. However, none of the specimens in that collection is identified in the contemporary Museum Register as *P. simplex* or anything similar. As Ritchie's collection contained *P. simplex* material from other localities (Rees & Thursfield, 1965) it seems likely that Ritchie mistakenly ascribed a Scottish locality to a foreign specimen. Further, the specimen on Ritchie's microslide preparation of *P. simplex* from Gough Island (BM(NH) 1964.8.7.105; duplicate material mentioned by Rees & Thursfield, 1965) is morphologically identical with that said to have come from near Sanda, and could well have come from the same colony.

The species is probably best considered unrecorded in the North Atlantic. A detailed redescription and synonymy were given by Ralph (1961).

'***Sertularia evansi***' Ellis & Solander, 1786

Distribution and remarks. Although the only European record of this species north of the Mediterranean Sea – from Norfolk, by Ellis & Solander, 1786 – now seems erroneous it was formerly quoted in British faunal accounts (e.g. Johnston, 1838, 1847; Gray, 1848; Landsborough, 1852). Removal of the species from the British list has been discussed in detail by Cornelius (in prep.). Once referred to the genus *Dynamena*, the species is now known as *Synthecium evansi* and placed in the family Syntheciidae. The species is included here as the faunal accounts just mentioned referred it to the present family; and the Syntheciidae – which has no truly British representative – will not be treated in the present sequence of papers.

Sertularia mirabilis (Verrill, 1873)

Diphasia mirabilis Verrill, 1873 : 9–10.
Selaginopsis mirabilis: Nutting, 1904 : 128, pl. 38, figs 11–12 (syn. *Polyserias hincksii* Mereschkowsky); Ritchie, 1909a : 217–220, figs 1–2; Rees & Thursfield, 1965 : 153.
Sertularia mirabilis: Kudelin, 1914 : 224–233, figs 62–65, 65a (syn. *Polyserias hincksii* Mereschkowsky); Broch, 1918 : 133–134; Naumov, 1960 : 365–367, fig. 257, pl. 8, fig. 1; Naumov, 1969 : 394–395, fig. 257, pl. 8, fig. 1; Calder, 1970 : 1532, pl. 7, fig. 3.
Polyserias hincksii Mereschkowsky, 1877 : 226, pl. 6, figs 15–16.

Fuller synonymies of earlier accounts were provided by Nutting (1904) and Kudelin (1914).

Distribution and remarks. Not yet reliably recorded from the present area. One spirit specimen and 2 microslide preparations in the BM(NH) collections (1910.10.4.18 and 1964.8.7.181) are parts of those said to have been taken off the Yorkshire coast by James Ritchie (1909*a*). The first number refers to a fertile colony 100 mm long preserved in spirit, and a microslide made from it. The specimen was given by Ritchie to Sir John Murray who presented it to the BM(NH) in 1910. The second number refers to the microslide specimen illustrated by Ritchie (1909*a* : fig. 1) and mentioned by Rees & Thursfield (1965 : 153) who record that there is a duplicate microslide in the Royal Scottish Museum, Edinburgh. The two BM(NH) specimens appear to be parts of larger colonies mentioned by Ritchie, said to have been removed from a stone entangled in the net of a Hull trawler when it returned to port. The trawler had made its last hauls off Flamborough Head, Yorkshire, and since Ritchie was told by his collector that the specimens had been fresh it seems plausible that he assumed they had come from that locality. However, neither of the two BM(NH) specimens has any coenosarc or hydranth tissues preserved. Although these might have been lost after the specimen was collected, it nevertheless seems plausible that the specimens had become entangled in the net on a more distant haul. As there are no other records of this species from the present area it seems best to regard the record unproven. It is perhaps unlikely that such a distinctive species should not have been found by other collectors. *S. mirabilis* is otherwise recorded as being arctic and sub-arctic in the North Atlantic (Broch, 1918; Naumov, 1969). It has been found as far south as west of the Faroes in deep water (Broch, 1918), although on the east and west coasts of North America the species extends further south than on the west coast of Europe (Ritchie, 1909*a*; Rees & Thursfield, 1965; Naumov, 1969; Calder, 1970).

Sertularia robusta (Clarke, 1877)

Thuiaria robusta Clarke, 1877 : 227–228, pl. 15, figs 53–55.
Sertularia robusta: Naumov, 1960 : 364–365, fig. 255 (syn. *S. fabricii:* Nutting, 1904; Broch, 1918); Calder, 1970 : 1533, pl. 7, figs 5–6; Vervoort, 1972 : 183–184 (syn. *S. fabricii:* Levinsen, 1893; Hartlaub, 1901; Nutting, 1904; Broch, 1918).

DISTRIBUTION AND REMARKS. Although recorded from the 'North Sea' by Naumov (1969) this species has generally been regarded as sub-arctic in distribution and seems not to have been reported from the present area. The species has not been recorded south of the Faroes on the western side of the Atlantic (Broch, 1918; Vervoort, 1972), and Naumov's comment probably refers to the northern part of the North Sea, outside the present area. The species has been redescribed by Naumov (1969), Calder (1970) and Vervoort (1972).

Stereotheca elongata (Lamouroux, 1816)

Sertularia elongata Lamouroux, 1816 : 189, pl. 5, fig. 3; Ritchie, 1907*b* : 78–83, pl. 111.
Stereotheca elongata: Ralph, 1961 : 762–764, fig. 4e–k; Rees & Thursfield, 1965 : 144–145.

DISTRIBUTION AND REMARKS. This species is known from Australia, Tasmania, New Zealand and South Africa (Ralph, 1961; Millard, 1975). A single specimen said to have been dredged off NE Scotland by James Ritchie in 1904 was supposed to have drifted to Britain attached to floating vegetation (Ritchie, 1907*b*; repeated by Millard). However, as there is no other North Atlantic record of this distinctive species it seems probable that Ritchie's record is erroneous. The specimen said to have come from Scottish waters is a microslide preparation in the Royal Scottish Museum (RSM No. 1959.33.535) (Rees and Thursfield, 1965). The BM(NH) collection includes 2 microslides from the Ritchie collection taken in Australian waters, numbered 1964.8.7.158–159, but these differ in detail from the 'Scottish' specimen.

Redescriptions of the species were provided by Ralph (1961) and Millard (1975).

Notes

[1] Robert Brown was the first Keeper of Botany at the British Museum. Thompson (1856 : 455) listed a specimen of this species collected by Brown from Ballycastle, in the collection of a one J. L. Drummond. [p. 253]

[2] The species was not listed among the North Sea fauna by Broch (1928), perhaps indicating its scarcity there at that time. [p. 257]

[3] The only fertile hydrocladium was returned to Dr Cabioch prior to registration of the remainder of the material, for his detailed study. All the material remaining in the BM(NH) is infertile. [p. 259]

[4] as well as *Tamarisca tamarisca* (see Fig. 29 and p. 305); and also *Tulpa diverticulata* Totton, 1930 (family Campanulariidae, by Millard, 1977). [p. 260]

[5] *Sertularia rugosissima* Thornely, 1904, based on infertile material from Sri Lanka (Ceylon), was referred to *S. hupferi* Broch by Thornely (1916) in a later paper and might, therefore, be conspecific with *D. tropica*. Jaderholm (1919) pointed out the similarity between *S. rugosissima* and *S. hupferi*, but did not propose a formal synonymy. [p. 260]

[6] There is an inconsistency in Allman's (1874*a*) paper concerning the type locality. In the unnumbered table (page 471) he gave it as 60° 14′ N, 6° 17′ W, depth 632 fm; while in the text (page 474) it was given as 64° 15′ N, 6° 15′ W, again 632 fm. Other collecting stations cited in the paper are no further north than 62° 1′ N; and while the stated depth at the first locality corresponds closely with that shown on modern Admiralty charts the depth at the more northerly locality is shown as approximately 1360 fm. The 60° 14′ N, 6° 17′ W locality thus seems the more likely of the two to be correct and a specimen collected from H.M.S. 'Porcupine' bearing these coordinates in the BM(NH) collection (1912.12.21.108, male colony in spirit, probably figd., Allman, 1874*a*; via A. M. Norman collection) appears to be type material. The first line of Allman's (1874*a*) account of *D. coronifera* suggests that the description was based on only one specimen, almost certainly the present one, which is thus holotype. [p. 263]

[7] The mollusc was probably the Indo-Pacific species now known as *Pinctada margaritifera* (Linnaeus, 1758) (P. B. Mordan, pers. comm.). [p. 265]

[8] Bale (1884) recorded material (as *D. pinnata*) from 'Sydney' and 'South Africa'. However, the species seems otherwise unrecorded outside the North Atlantic and the records seem dubious. Millard (1975) doubted the South African record. Both were quoted uncritically by Hincks (1868). [p. 266]

[9] except by Millard (1975 : 261), who called it *Diphasia nigra* in a brief zoo-geographical comment. [p. 267]

[10] although Johnston (1847) mistakenly referred male material to one species and female to the other. This was realized by Hincks (1868) and briefly noted in his synonymy under *Diphasia pinnata*. [p. 267]

[11] which was based on a clear illustration of Ellis (1755). The species has been widely regarded as valid. [p. 267]

[12] Evidence for this is the markedly bent, half adnate hydrothecae and regularly pinnate colony habit with close-set branches depicted by Ellis & Solander. [p. 269]

[13] None of the specimens in the collections of the Linnean Society of London (Savage, 1945 : 1298.1–2, 1298.28) resembles those described by Ellis, and as with most other sertularian hydroids it seems likely that Linnaeus based his designation on Ellis' illustration and not on specimens (see also p. 251). [p. 271]

[14] Unlike Linnaeus' (1758) diagnoses of most hydroids in his genus *Sertularia*, the diagnosis of *S. lichenastrum* and three other species are accompanied by short descriptions, a locality – Kamtchatka – and a collector's name – G. W. Steller. Although so late as 1 January 1767 Linnaeus wrote to John Ellis stating that until then Ellis had supplied all his hydroids (Smith, 1821 : 196; Cornelius, 1975*a* : 273) it seems that this was not so and that a few at least had already come from Steller's executors. Dr W. T. Stearn kindly examined the original description and designation of *S. lichenastrum* and informed me that there is little doubt that the provision of a description and locality indicates that Linnaeus made his designation from a specimen rather than from another author's account. It is known (Stejneger, 1936 : 543–544, 548) that soon after Steller's death in 1746 all his plant collections (then including hydroids) went to Linnaeus, who removed fragments before returning the material to Leningrad (then St Petersburg). Almost certainly the two fragments in the Linnean Society of London collection, labelled *Sertularia lichenastrum* in Linnaeus' hand and preserved on herbarium sheet 1298.26 (Savage, 1945), are Steller's specimens and those or parts of those on which the diagnosis of the species was based. The fragments (Fig. 18) are here regarded as syntypes of *S. lichenastrum* Linnaeus, 1758. (The remainder of the material might still be in the Leningrad collections (Stejneger, 1936 : 545), but was not mentioned by Kudelin (1914) in his detailed material lists and could not be located through the normal channels by the present author.) The herbarium sheet has two specimens, on the right and left sides of the page. The right hand specimen, labelled VI (probably to correspond with plate 6 of Ellis, 1755), is a piece of main stem 15 mm long with 4 side-branches, 3 of which are branched. Each final branch has a row of slightly projecting hydrothecae on each side, alternate hydrothecae pointing left and right. No operculae are visible. The specimen has numerous ovoid gonothecae with apertures only slightly less wide than their maximum diameters. The second fragment, on the left of the sheet, is of the same species and probably came from the same colony. It is a short piece of main stem with two side branches, and like the other fragment has numerous gonothecae.

Linnaeus gave the locality 'Kamtchatka' for the species. Stejneger recorded that many of Steller's collecting labels were separated from the specimens, and Hultén (1927 : 6) considered that Linnaeus wrongly ascribed the type locality 'Kamtchatka' to many Steller plant specimens. Possibly Linnaeus received them without labels. Certainly much of Steller's collecting was done in Kamtchatka but he also collected for differing periods in Alaska, Bering Island and several localities in the Sea of Okhotsk (Stejneger, 1936), so that the locality of the present specimen was not necessarily Kamtchatka. The Linnean Society fragments of *S. lichenastrum* seems conspecific with *Thuiaria sachalini* Kudelin, 1914, as redefined by Naumov (1960, 1969), and *Sertularia lichenastrum* Linnaeus, 1758, can be regarded its senior synonym. The combination by which the species should be known is *Salacia lichenastrum*. Naumov states that 'Salacia sachalini' is widespread in the seas of north-east Russia, and the type locality of *S. lichenastrum* can confidently be restricted to Kamtchatka, from which Linnaeus – perhaps mistakenly – supposed the type material to have come.

Fertile syntype material of *Thujaria alternitheca* Levinsen, 1893, in the BM(NH) collection (1896.8.15.4, two microslide preparations) seems identical with the syntypes of *S. lichenastrum* Linnaeus, 1758, and the two taxa appear conspecific. The gonothecae of the two type series are truncate and appear very similar but the gonothecae illustrated by Naumov (1969 : fig. 309) as *T. alternitheca* differ in tapering distally. Although the vegetative characters of Naumov's material seem similar to those of the type material of both *S. lichenastrum* and *T. alternitheca*, the Naumov material should perhaps not be referred to *S. lichenastrum* until its gonothecal characters can be better evaluated. [p. 279]

[15] Millard's (1957) suggestion that the internal cusps are easily lost through damage seems a less likely explanation of the recorded variation in their arrangement than that the variation is genotypic, as the cusps are in a protected position inside the hydrothecae; but a full explanation is lacking. [p. 283]

[16] *Sertularia pinnata* Templeton is here referred to *Sertularella gayi* Lamouroux (see p. 287). [p. 287]

[17] following Hancock *et al.* (1956). [p. 296]

[18] Millard's (1975) designation of the type locality as 'Atlantic Ocean' seems erroneous. [p. 296]

[19] The material labelled *S. polyzonias* in the collection of the Linnean Society of London includes 5 specimens of *Symplectoscyphus tricuspidatus* in addition to several specimens of *Sertularella polyzonias* as here defined. The specimens are discussed under *S. polyzonias* (p. 288). [p. 304]

[20] The genus name *Ellisia* was introduced by Westendorp (1843 : 22) to accommodate the present species alone. There seems no need for a separate genus for *Sertularella rugosa*, however; and *Ellisia* Westendorp should be considered a senior synonym of the genus name *Sertularella* Gray, 1848, which although more recent is wider in scope. As Bedot (1905 : 74) pointed out the name *Ellisia* had been introduced still earlier, by Forbes & Goodsir (1840), for an entirely different genus of hydroids, so that *Ellisia sens.* Westendorp is a junior homonym; and the widely used name *Sertularella* Gray, 1848, remains available. [p. 291]

[21] *Dynamena dubia* Billard, 1922*a*, type locality La Pallice, W France (by subsequent designation by Billard, 1927), has been recorded from several localities along the west coast of France including the Glenan Isles just south of the faunal boundary adopted here. *D. dubia* seems very close to *Sertularia distans* and may prove conspecific, but I have not seen material. Billard (1927) and Fey (1969) referred the species to the genus *Salacia*, but this seems quite unjustified. [p. 299]

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An observation on distribution in *Sertularia distans* was made while on a visit to the Rijksmuseum van Natuurlijke Historie, Leiden and the Instituut voor Taxonomische Zoölogie, Zoölogisch Museum, Universiteit van Amsterdam, funded by the Stichting Jan Joost ter Pelkwijk Fonds, to which I am much indebted.

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Accepted names are shown in roman type, invalid names in *italic type*. Main page references are in *italics*.

Addenda

Some of the nomenclatural changes proposed here have been incorporated in Evans, F. O. (1978) [The marine fauna of the Cullercoats district. 6. Coelenterata and Ctenophora. *Rep. Dove mar. Lab.* (3) **19**: 1–165], with my agreement. The work provides further distribution data on many of the species included here. However, the distribution changes discussed above are not contradicted by Evans' data.

Type material of *Diphasia margareta* has recently been located (p. 263):—infertile fragment of colony on herbarium sheet, coll. A. H. Hassall, via G. Johnston; presumably from one of Hassall's Irish localities; BMNH regd no. 1842.12.7.10; syntypes (mentioned, Johnston, 1847: 72).

Sertularella gaudichaudi was first described by Lamouroux, in Freycinet, L. de (editor) (1824) [*Voyage autour du monde entrepris par ordre du Roi. Zoologie;* by Quoy, J. R. C. & Gaimard, J. P.; Paris; p. 615, pl. 90, figs 4–5] and later in the same year by Lamouroux *et al.* (see p. 282).